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**Intermountain
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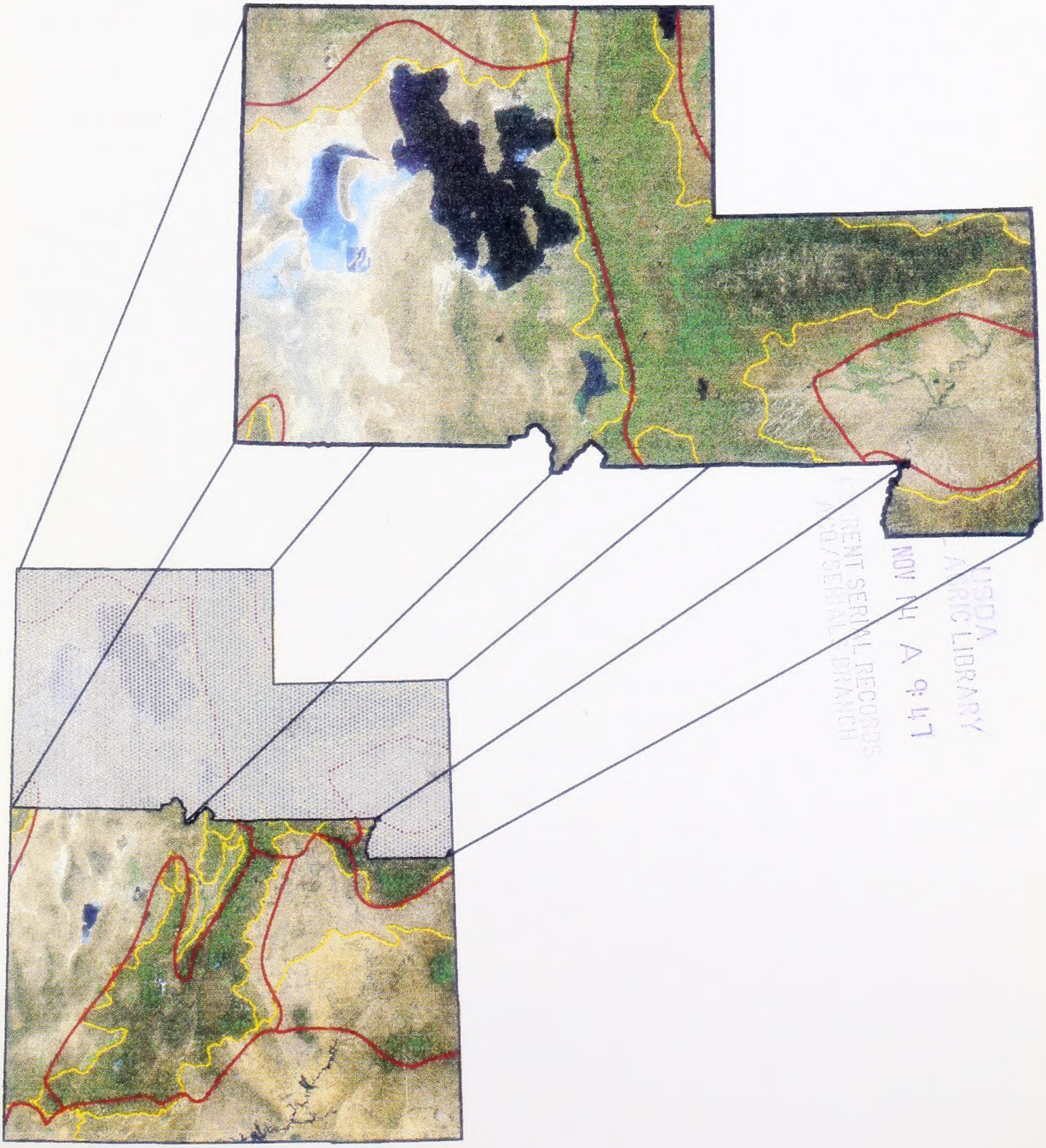
Forest Resources of Northern Utah Ecoregions

Renee A. O'Brien



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The Author

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Research Summary

This report presents the condition and extent of the forest resources of northern Utah ecoregions. The ecoregion definitions are based on the Ecological Classification and Mapping Task Team (ECOMAP 1993) framework. The ecoregions, or portions thereof, that occur within the political boundaries of northern Utah are the Intermountain Semidesert and Desert Province (Desert), the Southern Rocky Mountain Steppe/Open Woodland/Coniferous Forest/Alpine Meadow Province (Southern Rockies), the Intermountain Semidesert Province (Semidesert), and the Nevada-Utah Mountains Semidesert/Coniferous Forest/Alpine Meadow Province (Nevada-Utah Mountains). In northern Utah, the Desert Province is 11 percent forested, the Southern Rockies Province is 54 percent forested, the Semidesert Province is 9 percent forested, and the Nevada-Utah Mountains Province is 71 percent forested. The most common tree found in the forest land of the Desert and Semidesert Provinces is Utah juniper, compared with Gambel oak in the Southern Rockies and Nevada-Utah Mountains Provinces. The most commonly encountered shrub in the forest land of the Desert and Semidesert provinces is big sagebrush. In the forests of both the Southern Rockies and Nevada-Utah Mountains Provinces, the most common shrub is mountain snowberry. Average total live tree biomass is estimated to be 14.5 tons per acre in the Desert Province, 30.2 tons per acre in the Southern Rockies Province, 13.8 tons per acre in the Semidesert Province, and 21.8 tons per acre in the Nevada-Utah Mountains Province. The report also summarizes average net annual growth, potential growth, mortality, number of standing dead trees, habitat type occurrence, fire evidence, ownership, and land use patterns by province.

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Contents

Page

Introduction 1
Province Descriptions 3
  Intermountain Semidesert and Desert Province 3
  Southern Rocky Mountain Steppe/Open Woodland/Coniferous Forest/Alpine Meadow Province 4
  Intermountain Semidesert Province 6
  Nevada-Utah Mountains Semidesert/Coniferous Forest/Alpine Meadow Province 7
Sampling Procedures 7
Ecological Conditions 9
  Species 9
  Biomass 12
  Habitat Types 13
Forest Health Issues 15
  Growth Rate 15
  Mortality 15
  Snags 15
  Aspen 16
  Fire 16
Ownership and Land Use Patterns 17
Summary 20
References 21

Page

Appendix A: Common and Scientific Plant Species Names 22
Appendix B: Forest Survey Tables 24
1. Number of live trees on forest land by province, species, and diameter class in northern Utah, 1993 24
2. Total live tree biomass on forest land by province, species, and diameter class in northern Utah, 1993 26
3. Percent of timberland area in each province that is accounted for by each habitat type series in northern Utah, 1993 28
4. Percent distribution of growing-stock trees on timberland in each province, by habitat type series and species in northern Utah, 1993 29
5. Net annual growth of all live trees on forest land by province, species, and diameter class in northern Utah, 1992 30
6. Annual mortality on forest land by province, species, and diameter class in northern Utah, 1992 32
7. Annual mortality on forest land by province, species, and cause of death in northern Utah, 1992 33
8. Number of snags on forest land by province, species, and diameter class in northern Utah, 1993 34

Forest Resources of Northern Utah Ecoregions

Renee A. O'Brien

Introduction

An inventory of northern Utah's forest resources was recently completed by the U.S. Department of Agriculture, Forest Service, Interior West Resource Inventory, Monitoring, and Evaluation (IWRIME) Program, as part of its Forest Inventory and Analysis (FIA) activity. This report presents the condition and extent of the forest resources of northern Utah by ecoregion, based on the Ecological Classification and Mapping Task Team (ECOMAP 1993) framework. This is a more ecological approach to reporting than traditional FIA reports because data are grouped biogeographically rather than politically. Emphasis is placed on species diversity, forest health, and land use issues. Traditional timber summaries and tables and associated data reliability will be published for northern Utah in a complementary report by Brown (in preparation). Scientific names for all plant species' common names used in this paper can be found in appendix A.

ECOMAP was formed to develop a consistent approach to ecosystem classification and mapping at multiple geographic scales. This approach was identified as essential for planning and implementing ecosystem management. Ecoregions and subregions are classified and mapped based on associations of biotic and environmental factors that regulate the structure and function of ecosystems. These factors include climate, physiography, soils, air, hydrology, and potential natural communities. The national map of ecoregions and subregions of the United States (Bailey 1995) was the starting point for the summaries in this report. However, the ecoregions of the United States are mapped at a scale of 1:7,500,000, and are not yet refined for smaller-scale (subregion) uses. The ecoregion boundaries of Utah were adjusted by Homer (1994) in conjunction with the U.S. Department of the Interior, National Biological Survey's GAP analysis effort in Utah. Figure 1 illustrates the difference in ecoregion boundaries between the two classifications. The Homer classification of satellite imagery is based primarily on existing vegetation, in contrast with the multiple criteria used by Bailey, but is used in this report because it represents a more appropriate scale of delineation. Ecoregion names from Bailey (1995) were retained for the adjusted areas used in this report.

Ecoregions as classified and mapped by Bailey (1995) are made up of domains, divisions, and provinces. Smaller subdivisions are considered subregions. Divisions that occur in Utah are illustrated in figure 2. Ecoregion boundaries transcend political boundaries such as county and State, however the summaries in this report represent only those portions of the ecoregions and subregions that occur within the northern portion of the State. Information from southern Utah and surrounding States will be incorporated as it becomes available for more complete ecoregion summaries.

Provinces are subunits of divisions. The provinces of Utah are displayed in figure 3. The portions of provinces that occur within the political boundaries of northern Utah are the subject of this report and are illustrated in figure 4. They are the Southern Rocky Mountain Steppe/Open Woodland/Coniferous Forest/Alpine Meadow Province of the Temperate Steppe Division; and the Intermountain Semidesert and Desert Province, the Nevada-Utah Mountains Semidesert/Coniferous Forest/Alpine Meadow Province, and the Intermountain Semidesert Province of the Temperate Desert Division.

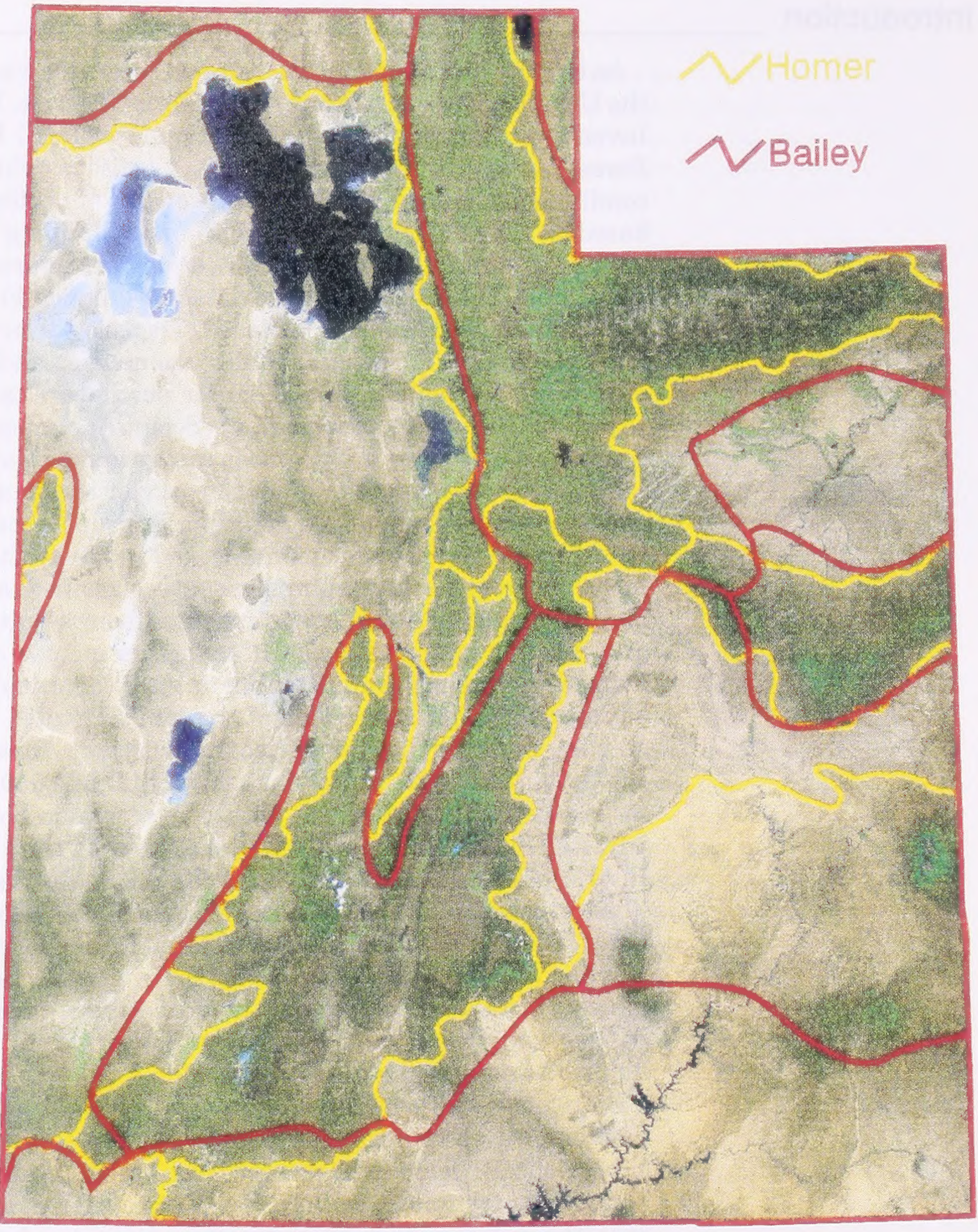

Figure 1—Bailey's ecoregion boundaries for Utah overlaid by Homer adjustments.

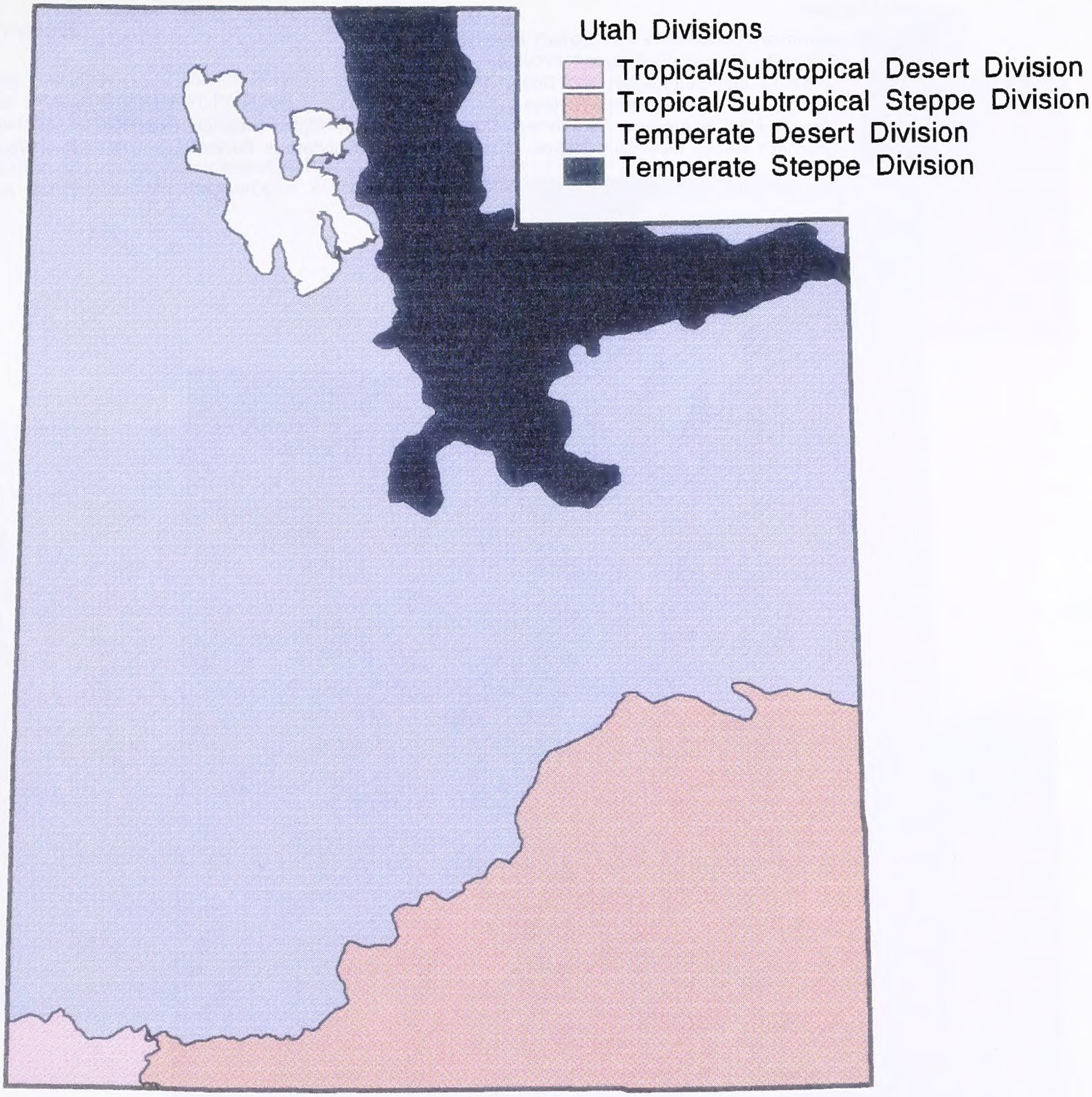
Utah Divisions
Tropical/Subtropical Desert Division
Tropical/Subtropical Steppe Division
Temperate Desert Division
Temperate Steppe Division

Figure 2—Utah divisions.

Province Descriptions

Intermountain Semidesert and Desert Province

The province that covers the greatest portion of northern Utah is the Intermountain Semidesert and Desert Province (Desert). Two sections of this province, the Bonneville Basin and Uinta Basin, are in northern Utah (fig. 5). The Bonneville Basin Section is made up of narrow mountain ranges running north and south, separated by broad sediment-filled valleys, most of which have internal drainages. The mountains of this section were formed by faulting and have been significantly modified by erosion. Prominent features are large alluvial fans, playas, and salt flats. Annual precipitation averages between 4 and 10 inches, with the mountains receiving as much as 18 inches. Little of this precipitation comes in summer. Temperatures average 45 to 55 °F annually.

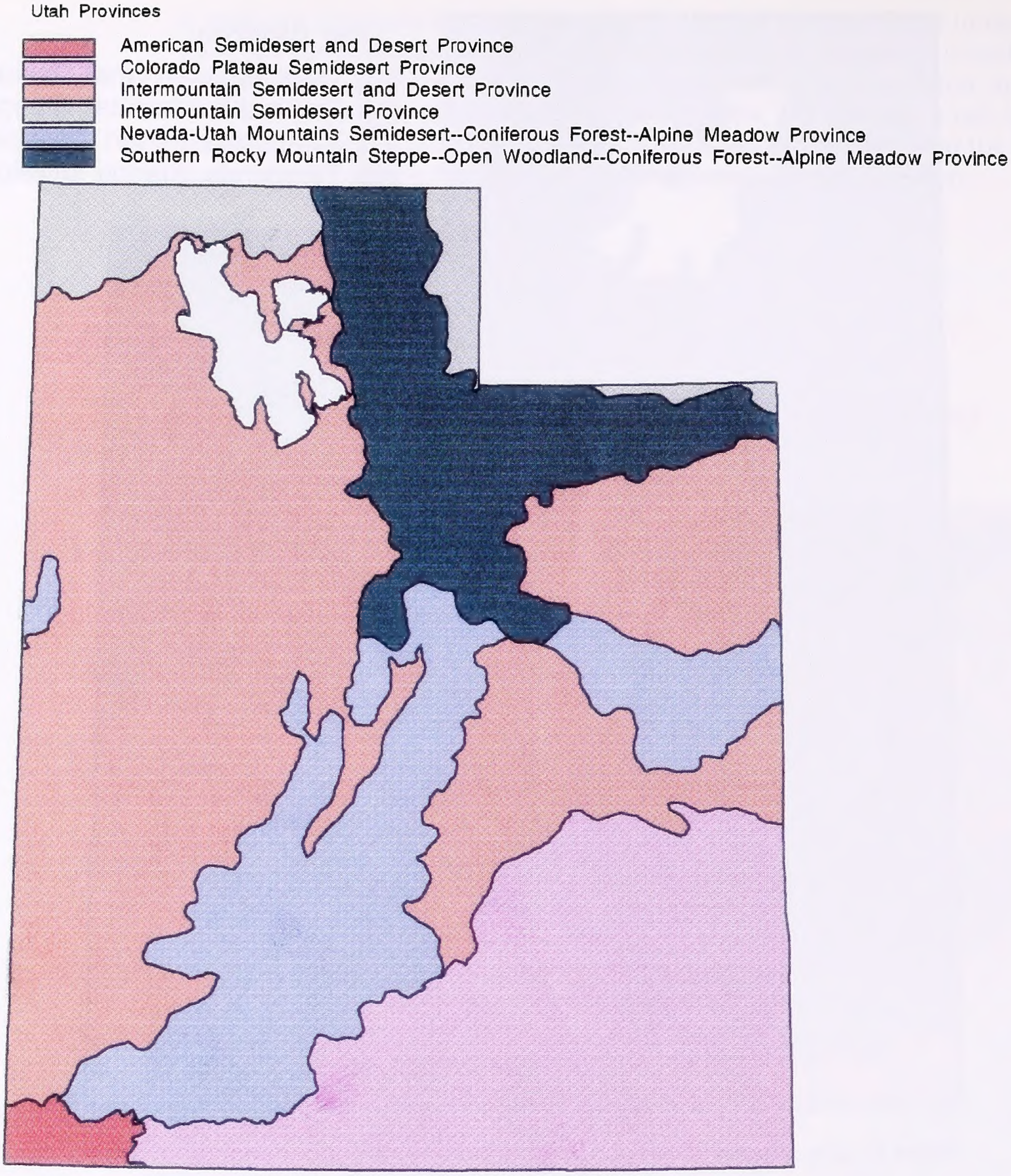
Utah Provinces
American Semidesert and Desert Province
Colorado Plateau Semidesert Province
Intermountain Semidesert and Desert Province
Intermountain Semidesert Province
Nevada-Utah Mountains Semidesert--Coniferous Forest--Alpine Meadow Province
Southern Rocky Mountain Steppe--Open Woodland--Coniferous Forest--Alpine Meadow Province

Figure 3—Utah provinces.

The Uinta Basin section is a synclinal and topographical basin, the central portion of which is gently rolling with eroded slopes. Elevation ranges from 6,200 to 7,300 ft. Precipitation averages between 7 and 12 inches annually, with most occurring in spring and fall. Temperatures average 40 to 52 °F annually.

Southern Rocky Mountain Steppe/Open Woodland/Coniferous Forest/Alpine Meadow Province

Each province is divided into sections (fig. 5). Parts of two sections of the Southern Rocky Mountain Steppe/Open Woodland/Coniferous Forest/ Alpine Meadow Province (Southern Rockies) occur in Utah. The Overthrust

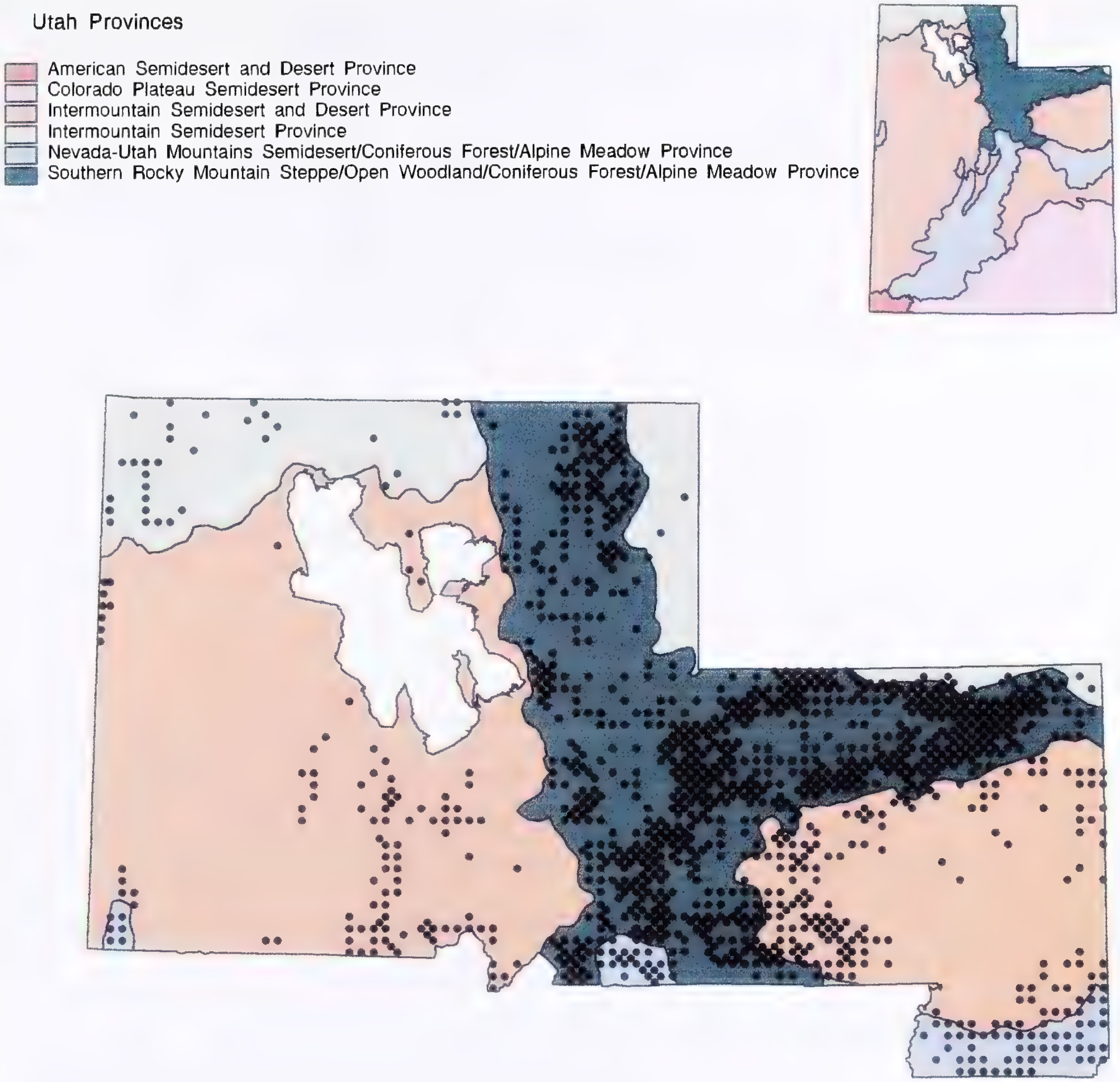
Utah Provinces
American Semidesert and Desert Province
Colorado Plateau Semidesert Province
Intermountain Semidesert and Desert Province
Intermountain Semidesert Province
Nevada-Utah Mountains Semidesert/Coniferous Forest/Alpine Meadow Province
Southern Rocky Mountain Steppe/Open Woodland/Coniferous Forest/Alpine Meadow Province

Figure 4—Northern Utah provinces and forested IWRIME plot locations.

Mountain Section includes mountain ranges in western Wyoming and southeastern Idaho, and the Wasatch Range of north-central Utah.

The Wasatch Range has very steep topography and an extensive and active fault. Elevation ranges from 5,000 to 13,000 ft. The higher elevations in this section have been glaciated, with glacial features such as cirques and moraines. Annual precipitation averages between 16 and 40 inches, mostly in the form of snow above 6,000 ft. Summer precipitation is low, and average annual temperatures range from 35 to 45 °F.

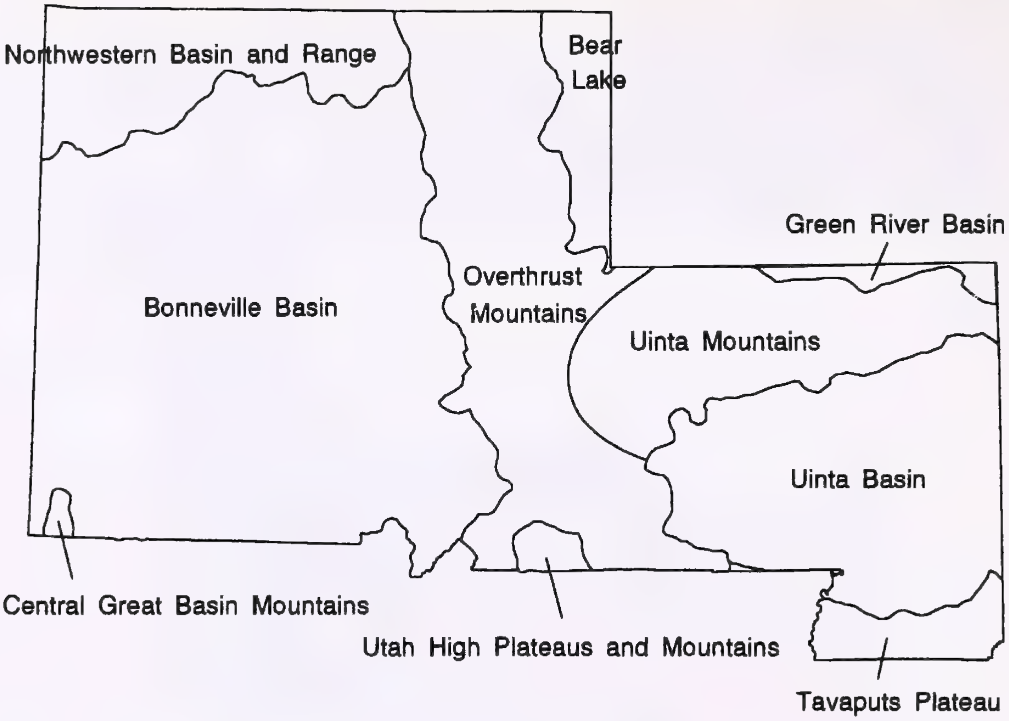

Figure 5—Northern Utah sections.

The Uinta Mountains Section is located in northeastern Utah and the southwest corner of Wyoming, and includes Kings Peak, the highest point in Utah at 13,528 ft elevation. The mountains are an anticlinal uplift with an east-west orientation, a feature that is unique to the entire western United States. Glacial processes have shaped higher elevation landforms, and erosion by water and wind are the active land-forming processes at lower elevations. Precipitation averages between 8 and 35 inches annually. At high elevations, most of the precipitation comes in the form of winter snow. At lower elevations, winter and summer precipitation are about equal. Average temperature ranges from 28 to 45 °F.

Intermountain Semidesert Province

Parts of three sections of the Intermountain Semidesert Province (Semidesert) occur in northern Utah (fig. 5). The Northwestern Basin and Range Section, occurring in Nevada, Oregon, Idaho, and extending into extreme northwestern Utah is characterized by nearly level basins and valleys bordered by long, gently sloping alluvial fans. The elevation of this section ranges from 4,000 to 7,200 ft. Precipitation averages 4 to 20 inches annually, generally occurring in fall, winter, and spring. Annual temperatures average 41 to 50 °F.

The Bear Lake Section of Idaho, Wyoming, and Utah is characterized by steep north-south oriented mountain ranges with broad linear valleys, formed mostly by thrust and faults, landslides, and pluvial action. Average annual precipitation is 16 to 40 inches, coming mostly in fall, winter, and spring. Average temperatures range from 34 to 48 °F.

The Green River Basin Section, occurring in a sliver of extreme northeastern Utah, is made up of low mountains and narrow valleys having steep gradients. Broad intermountain basins were formed by alluvial fans and piedmont plains joining. Elevation of the hills ranges from 3,600 to 7,900 ft. Precipitation ranges from 7 to 20 inches and temperatures average between 39 and 52 °F annually.

Nevada-Utah Mountains Semidesert/Coniferous Forest/Alpine Meadow Province

The Nevada-Utah Mountains Semidesert/Coniferous Forest/Alpine Meadow Province (Nevada-Utah Mountains) is located in parts of Nevada, Utah, and Colorado, and is divided into three sections (fig. 5). Small portions of each of the three sections occur in the northern Utah counties selected for this report, although a much greater portion of this province occurs in the southern part of the State. More complete information about this province will be available in the Utah State report.

Part of one section, the Central Great Basin Mountains, occurs in western Utah (the Deep Creek Mountains). The dominant landforms of this section are north-south running mountain ranges, separated by broad sediment-filled valleys. Elevation ranges from 5,000 to 13,000 ft. Summers are hot and dry; winters are cold and dry. Annual precipitation ranges from 5 to 25 inches and temperatures average between 38 and 50 °F.

A portion of a second section, the Tavaputs Plateau, is in eastern Utah and western Colorado, and encompasses some of the most rugged country in Utah. Strata rise gradually out of the Uinta Basin to reach elevations of 10,000 ft before abruptly dropping off southward. Elevation ranges from 7,300 to 10,000 ft. Annual precipitation is between 8 and 35 inches, and temperatures average between 34 and 45 °F. Much of the precipitation at higher elevations falls in winter in the form of snow. At lower elevations, summers are hot and dry, in contrast to summers at higher elevations, which are warm and wet.

A third section, the Uinta High Plateaus and Mountains, is found in its entirety in south-central Utah. This section is a series of plateaus that have relatively high elevations, gently rolling on top but rising steeply from valley bottoms. They are fault-controlled and aligned in a north-south direction. The tops of the plateaus are capped with volcanic flows and glacial deposits. Elevations range from 5,000 to 13,000 ft. Precipitation is distributed somewhat evenly throughout the year and ranges between 14 and 35 inches. Annual temperatures average between 32 and 47 °F.

Sampling Procedures

The Interior West Resource Inventory, Monitoring, and Evaluation Program uses a two-phase sampling procedure for statewide forest inventories. Phase one employs land status maps and aerial photos for classifying map grid points to determine ownership and area estimates. Phase one sample points are located every 1,000 m. From this first, or photo interpretive, phase it was determined that only about 25 percent of the total area of northern Utah is forest land. The second, or field, phase is conducted on forest land, and is a 4 percent subsample of the first phase points on a grid spacing of 5,000 m. Field plots consist of either a cluster of five variable-radius subplots covering about 1 acre, or a ⅒-acre circular plot depending on the tree species being measured. Seedlings and saplings are measured on a 1⁄300-acre microplot in either case. Data from the two phases are combined to produce summary information and tables.

Forest land, for this inventory, was defined as land at least 10 percent stocked with trees, or currently nonstocked but formerly having such stocking, and where human activity on the site does not preclude natural succession of the forest. All conifers of any size except pinyon, juniper, and yew; and aspen, cottonwood, and paper birch automatically qualify as trees. Other species such as pinyon, juniper, maple, mountain mahogany, and oak are classified as either trees or as shrubs, depending on whether or not they have at least one stem 3 inches in diameter at root collar (d.r.c.) or larger, and 8 ft or more in length to a minimum branch diameter of 1.5 inches. If these other species are measured as trees, diameter is taken at root collar instead of at breast height. This is because these species typically have a multiple-stemmed growth form, with no main stem on which to measure diameter at breast height (d.b.h.). In this report, information presented by diameter class includes diameters taken at breast height or root collar, depending on the species.

The percent of the total area that is forested differs for each province within the State boundaries. In northern Utah, the Desert Province is 11 percent forested, the Southern Rockies Province is 54 percent forested, the Semidesert Province is 9 percent forested, and the Nevada-Utah Mountains Province is 71 percent forested. In addition, it was estimated from the number of nonforest field plots that 2 percent of the nonforest area of northern Utah is composed of shrub-form oak, maple, juniper, and mountain mahogany. Specifically, shrub-form oak covers approximately 9 percent of the nonforest area in the Southern Rockies Province, and shrub-form juniper covers about 4 percent of the nonforest area in the Nevada-Utah Mountains Province.

There are large differences in the number of field sample plots taken in each province, due mainly to: (1) the large difference in the amount of the total area of each province that occurs in northern Utah, (2) the difference in percentage of forest land in each province, and (3) the fact that National Forest System (NFS) lands were sampled at twice the intensity of other lands. The following is a breakdown of the area of northern Utah by percent in each province, the percent of each province that is forested, and the number of field plots in each province.

Province	Percent of total area	Percent forested	Number of field plots
Desert	57	11	268
Southern Rockies	28	54	806
Semidesert	12	9	47
Nevada-Utah Mountains	3	71	80

Expansion factors were adjusted based on sampling intensity, and plot data were weighted accordingly, but variances were probably higher for many of the Semidesert or Nevada-Utah Mountain values because of small samples. Confidence intervals for some estimates may be as much as 100 percent. Compilation procedures traditionally aggregate field sample plots within counties. For this report, plots were aggregated within provinces, which may result in small differences between this report and Brown (in preparation).

Ecological Conditions

Species

Forest vegetation and conditions are similar among the four provinces, but some overall differences become apparent when population data for each province are examined. One common way to summarize forest inventory data is by forest type. Figure 6 illustrates the forest type coverages for northern Utah (Powell and others 1993). However, forest types are based on complicated algorithms and named for the predominant species, masking the individual species makeup of each stand.

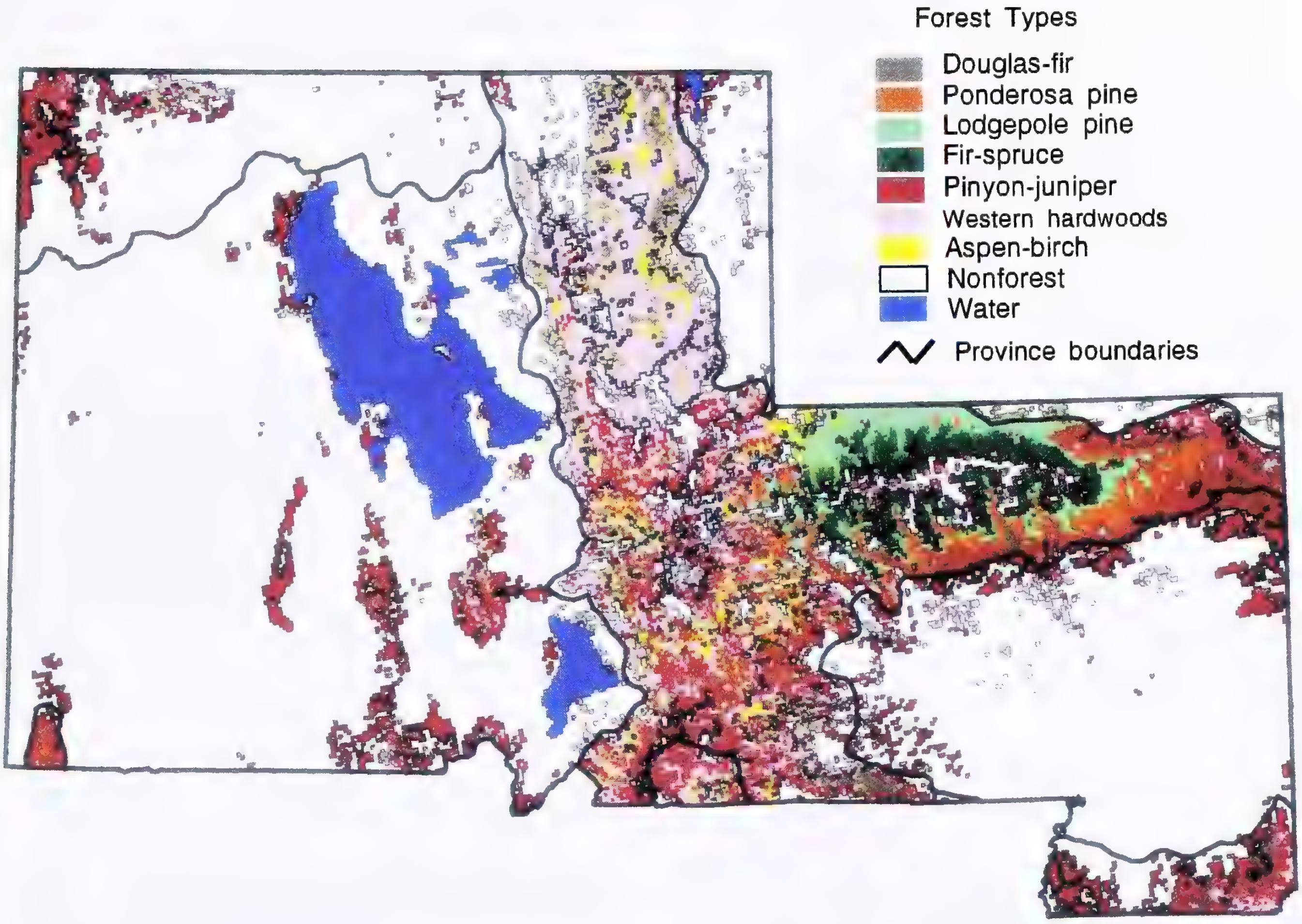

Figure 6—Forest types of northern Utah.

A simpler approach to tree species information is presented in the following list. Listed are the tree species found in each province, presented as a percentage of the total number of trees inventoried (table 1). The rankings are based on the number of live trees greater than 1 inch at diameter measurement and present tree species diversity for each province. A percentage of less than 1 is designated by a "T," indicating a trace.

	Percent
Desert	
Utah juniper	54
Common pinyon	18
Gambel oak	7
Aspen	6
Douglas-fir	4
Singleleaf pinyon	4
Curlleaf mountain mahogany	3
Subalpine fir	2
White fir	T
Rocky Mountain maple	T
Rocky Mountain juniper	T
Limber pine	T
Engelmann spruce	T
Bigtooth maple	T
Other poplar	T
Southern Rockies	
Gambel oak	31
Aspen	21
Lodgepole pine	14
Subalpine fir	10
Bigtooth maple	9
Engelmann spruce	5
Douglas-fir	4
White fir	1
Curlleaf mountain mahogany	1
Utah juniper	1
Common pinyon	1
Rocky Mountain maple	1
Rocky Mountain juniper	T
Ponderosa pine	T
Blue spruce	T
Limber pine	T
Other poplar	T
Semidesert	
Utah juniper	68
Singleleaf pinyon	8
Subalpine fir	8
Douglas-fir	5
Aspen	5
Common pinyon	3
Limber pine	1
Curlleaf mountain mahogany	1
Bigtooth maple	T
Engelmann spruce	T
Lodgepole pine	T
Rocky Mountain juniper	T
Ponderosa pine	T

Nevada-Utah Mountains	*Percent*
Gambel oak	40
Common pinyon	22
Utah juniper	17
Rocky Mountain juniper	5
Douglas-fir	4
Curlleaf mountain mahogany	3
Aspen	3
White fir	2
Subalpine fir	1
Singleleaf pinyon	1
Bigtooth maple	1
True mountain mahogany	T
Limber pine	T
Bristlecone pine	T
Ponderosa pine	T

In addition to the tree species information, 10 of the most commonly encountered shrub species (fig. 7), and 10 of the most common herbaceous species (fig. 8) are presented for each province. It should be pointed out that some species, curlleaf mountain mahogany, for example, occur on forest land

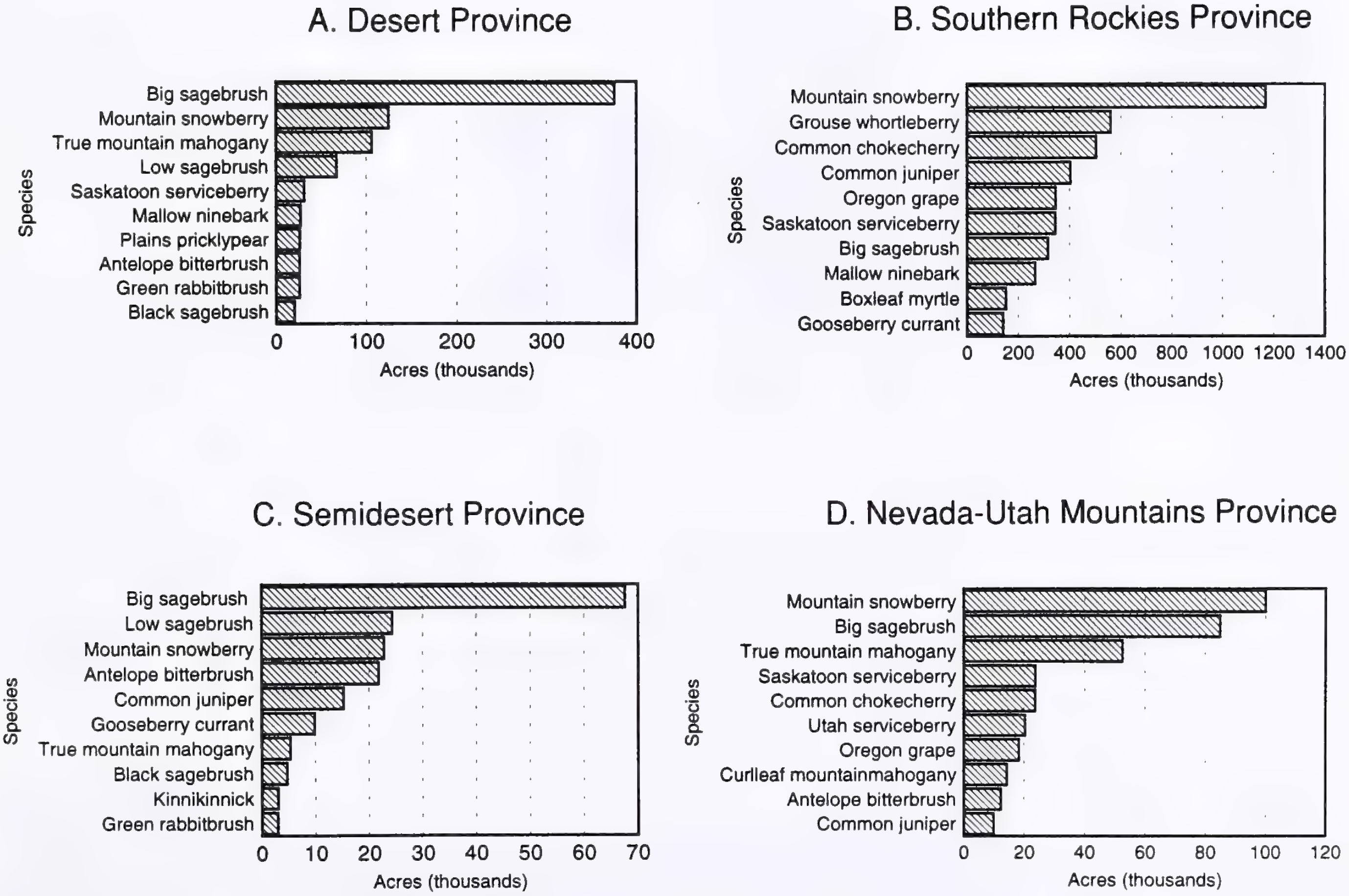

Figure 7—Occurrence of 10 common shrub species on forest land in each province in northern Utah.

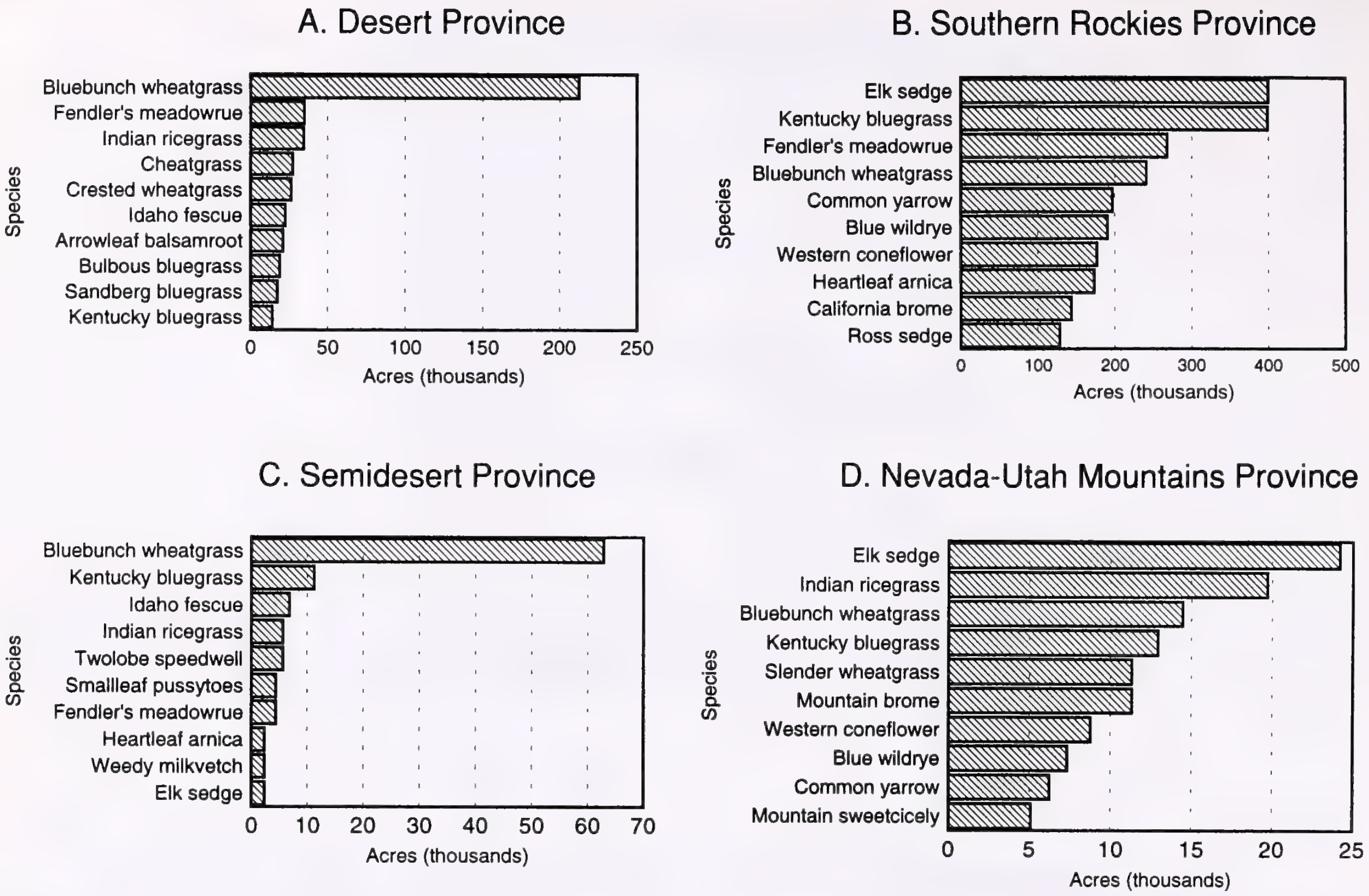

Figure 8—Occurrence of 10 common herbaceous species on forest land in each province in northern Utah.

in both tree and shrub form. On Utah inventory plots where the majority of plants of a species were tree form, they were measured as trees. On other sites where they did not achieve tree form, they were recorded as shrubs. For this reason some species are listed both as trees and shrubs within a province. Scientific names of shrubs and herbs are listed in appendix A.

Another example of the differences between provinces is illustrated in figure 9, where average percent canopy cover of seedlings, shrubs, forbs, and graminoids is presented for each province. The relative amounts of understory vegetation and the proportion of woody to herbaceous vegetation are determined by climatic, soil, and topographic factors, with precipitation being very influential. In Utah, these factors are strongly influenced by large elevation differences within each province, making general explanations difficult.

Biomass

Biomass estimates for each tree species in each province are presented by diameter class in table 2. These estimates include total oven-dry weight for all live trees at least 1 inch diameter. There are significant differences in average total biomass per acre between the provinces (fig. 10). Average total

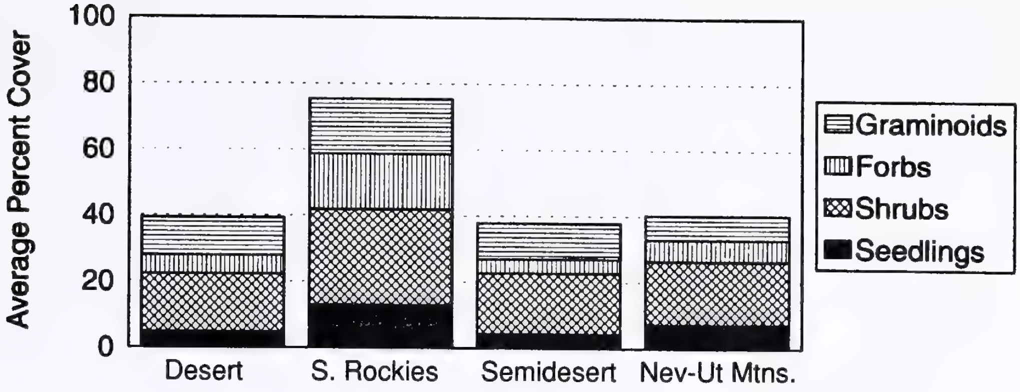

Figure 9—Average percent canopy cover of seedlings, shrubs, forbs, and graminoids by province in northern Utah.

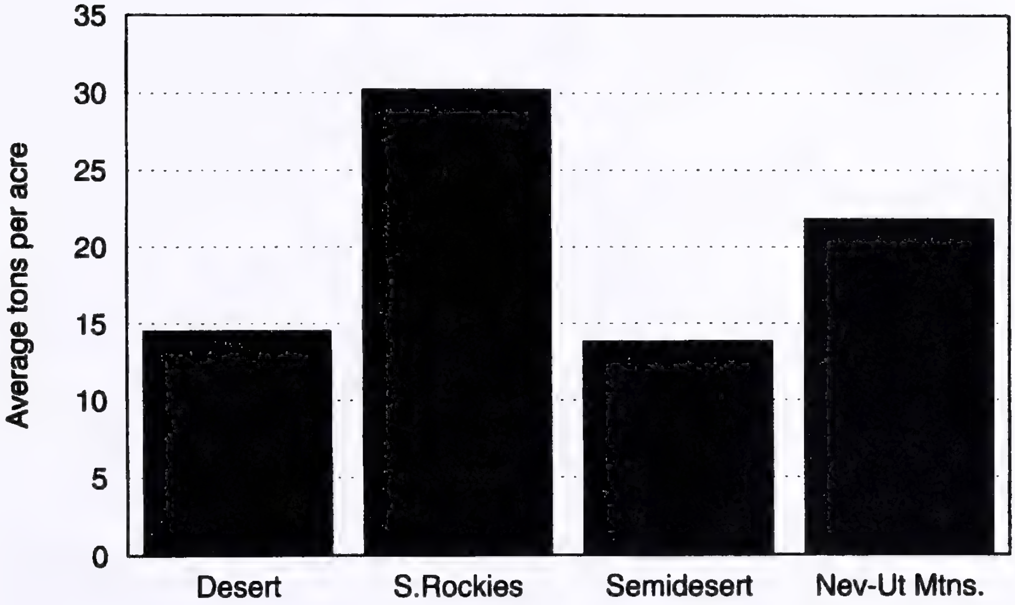

Figure 10—Average tons per acre of live tree biomass by province in northern Utah.

tree biomass is estimated to be 14.5 tons per acre in the Desert Province, 30.2 tons per acre in the Southern Rockies Province, 13.8 tons per acre in the Semidesert Province, and 21.8 tons per acre in the Nevada-Utah Mountains Province. An overall estimate of average tree biomass for northern Utah is 24.7 tons per acre. Total woody and nonwoody biomass estimates by ecoregion are being developed and will be available in the Utah State report.

Habitat Types

Habitat types are defined as lands potentially capable of producing similar plant communities at successional climax. The climax plant community, which is the theoretical end result of plant succession, reflects the integration of the environmental factors affecting vegetation, such as climate, soil, and landform. Habitat type classifications provide a common basis for improving communication, management interpretations, and research applications. Habitat type classifications exist (Mauk and Henderson 1984) for forest types such as ponderosa pine and Douglas-fir that traditionally have been referred to as timberland. Classification schemes for other types, such as pinyon-juniper, oak, maple, and mountain mahogany types, have not yet been developed.

For some forest types such as aspen, a community type approach to classification (Mueggler 1988) was chosen in preference to a habitat type approach because of the lack of well-defined successional status of communities within the overall aspen ecosystem. Community types are aggregations of similar plant communities based on existing floristics regardless of successional status. As with habitat types, community types are based on the premise that vegetation is an integrator of environment, and thus reflects major environmental differences.

In contrast to habitat types, the existing vegetation also reflects the effects of past disturbances. Therefore, community types may represent either climax plant associations or successional communities within a sere. A sere is defined as the entire sequence of plant communities inhabiting an area over time. Eventually, enough may be known about these ecosystems that habitat types can be developed. Until then, community types can be used in ways similar to habitat types, as a basis for mapping, communication, and resources management planning. Habitat and community types will be combined in the summaries in this report.

Habitat types are named after climax trees species, coupled with the name of the dominant or characteristic undergrowth species. The climax tree species is usually the most shade tolerant of the tree species adapted to the site. The tree level of classification is called the “series” and encompasses all the habitat types having the same dominant tree cover at climax. Habitat types differ from forest type classifications, which are based on current tree species occurrence.

The use of potential vegetation to classify forests by habitat types does not imply an abundance of climax vegetation in the present landscape. It simply portrays a hypothetical picture of forests within a common framework. In fact, most of the forest landscape reflects some form of disturbance and various stages of succession. Fire is a natural disturbance that affects the successional development of forests. Forest management activities do so as well. The use of classifications based on climax vegetation does not suggest that climax conditions should be a management goal; seral species are often preferred for many purposes. However, by summarizing inventory data by habitat type, a picture of the forests of northern Utah can be drawn that theoretically will not change with advancing succession or disturbance.

The large number of individual habitat types precludes a simple summary by type. However, individual types can be combined by series to give a landscape level picture of the potential vegetation of northern Utah. Table 3 shows the percent of the timberland area in each province that is represented by each habitat type series. To illustrate the contrast between current vegetation and potential vegetation, table 4 presents the distribution of different tree species within each habitat type series by province.

Forest Health Issues

Growth Rate

Net annual volume growth, derived for each province, shows something about the respective environmental conditions. Net annual growth of all live trees (table 5) equals gross annual growth minus annual mortality. Net annual growth per acre was calculated for the total forest land area within each province. An estimate of site potential, average potential growth, is based on measurements taken from site trees, and is also shown here as a comparison. Differences between average net growth and potential growth within provinces range from double to quadruple. The differences can be partially explained because net growth may be reduced due to mortality, nonstocked or overstocked stands, and potential may be inflated due to microsite effects. Rather large differences between the provinces would be expected given the diversity in elevation and annual moisture. For example, the Desert Province has low average net annual growth because it is dominated by species such as pinyon and juniper, and the Southern Rockies Province has high average net annual growth because it is dominated by species such as aspen and lodgepole pine.

Province	**Average net annual growth**	**Average potential growth**
	Cubic ft/acre/year	
Desert	3.14	12.55
Southern Rockies	13.39	36.68
Semidesert	6.41	11.98
Nevada-Utah Mountains	5.04	18.23

Mortality

Annual mortality equals the net volume of trees that have died from natural causes. Tree mortality in northern Utah was very high for some species and some size classes (table 6). In the Desert Province, for example, growth of aspen trees 15 inches diameter or larger is negative, which means that mortality exceeded growth for the inventory year (1993). In the Southern Rockies Province, the only species with overall negative net annual growth rates were subalpine fir and limber pine. However, in diameter classes greater than 9 inches, lodgepole pine, aspen, white fir, and Engelmann spruce show some negative growth rates (table 5). No mortality was recorded in the Semidesert Province, probably due to the small sample. Douglas-fir showed the greatest amount of mortality in the Nevada-Utah Mountains Province, with a consequent negative growth rate. In the Southern Rockies and Nevada-Utah Mountains Provinces, insects were estimated to be the primary cause of death, followed by disease (table 7). Disease was estimated to be the primary cause of death in the Desert Province. It should be noted that exact cause of death is often unknown, or is the result of a combination of factors.

Snags

Numbers of standing dead trees (snags) are summarized by species and diameter class in table 8. In contrast to annual mortality estimates, which are calculated for the year previous to the inventory, snags may have died many years in the past. Snags are an important component of forest habitats.

They are used by cavity-nesting birds for nesting and roosting and by other wildlife species as places to perch, den, or forage. Different wildlife species have specific snag requirements and show a preference for species or diameter and height combinations. A minimum number of snags per acre is important, but several hundred per acre, as in a beetle-killed lodgepole pine stand, provide no additional habitat benefits. These sorts of details are masked in table 8, which is only meant to give a general, landscape-level look at snag conditions. A summary of the average number of snags per acre by three diameter class sizes is presented by province:

Province	**5.0-10.9**	**11.0-20.9**	**21.0+**
		Inches	
Desert	3.5	2.7	0.3
Southern Rockies	19.8	4.8	0.3
Semidesert	1.6	1.7	0.2
Nevada-Utah Mountains	5.6	4.8	0.5

Lodgepole pine makes up a large part (31 percent) of the 19.8 snags per acre between 5.0 and 10.9 inches diameter in the Southern Rockies. These trees were most likely killed by mountain pine beetles during the large outbreaks of the recent past.

Aspen

Of particular interest for managers is the current state of aspen ecosystems, in Utah and across the West. Because of historical fire suppression efforts and grazing pressure on aspen reproduction, many sites that were once dominated by aspen are now dominated by conifers or sagebrush (DeByle and others 1987; Mueggler 1988). A screening of IWRIME data shows that approximately 29 percent of northern Utah forest land has aspen present in the form of at least one live or dead tree. Of the area with aspen present, only 51 percent has the plurality of aspen stocking necessary to be classified as aspen forest type. This difference in area between where aspen occurs and where it dominates may support the hypothesis that aspen as a forest type is declining, resulting in the reduction of aspen as a component of the landscape (Bartos 1995). Most of the aspen in northern Utah occurs in the Southern Rockies Province, which has 93 percent of the acres with any aspen present and 93 percent of the aspen forest type. Looking just at the forest land of the Southern Rockies Province, 44 percent has some aspen present, and 22 percent is in the aspen forest type.

Fire

Wildfire has played a major role in forest succession in Utah (Bradley and others 1992). Lodgepole pine, for example, owes much of its widespread occurrence to past fire. Decadent aspen stands are rejuvenated by periodic fire. Without fire, Douglas-fir, white fir, and subalpine fir start to dominate areas where otherwise ponderosa pine or Engelmann spruce would prevail. Recent evidence of burning that impacted the entire sample acre is noted by IWRIME field crews, based on visual evidence such as burned stumps or fire scars. Overall, in northern Utah, 80 percent of the area shows no evidence of burning. The number of acres with no evidence is slightly higher (83 percent) in the Nevada-Utah Mountains Province and slightly lower (73 percent) in the Semidesert Province. These observations, coupled with the high levels of tree mortality in northern Utah, lend support to the idea that the likelihood of high intensity fire is increasing, at least in some areas (Beschta and others 1995).

Ownership and Land Use Patterns

Ownership patterns affect the use of forest land in many ways. Figure 11 illustrates the ownership distribution for all land in northern Utah. Figure 12 shows the distribution of forest land area in each province by owner class. The overall breakdown of forest land ownership in northern Utah is: National Forest System (NFS) 45 percent; other public, 25 percent; and private, 30 percent. National Forest System ownership makes up 10 percent of the forest land in the Desert Province, 66 percent of the forest land in the Southern Rockies Province, 14 percent of the forest land in the Semidesert Province, and 16 percent of the forest land in the Nevada-Utah Mountains Province. The amount of forest land that is privately owned is slightly more constant between Provinces: 35 percent of the Desert Province, 28 percent of the Southern Rockies Province, 45 percent of the Semidesert Province, and 25 percent of the Nevada-Utah Mountains Province.

Proximity to roads, or "roadlessness," of forest land is a topic of current interest. From each plot location center, field crews determined the straight-line distance to the nearest improved road. Fourteen percent of forest land in the Nevada-Utah Mountains Province is more than 5 miles from the

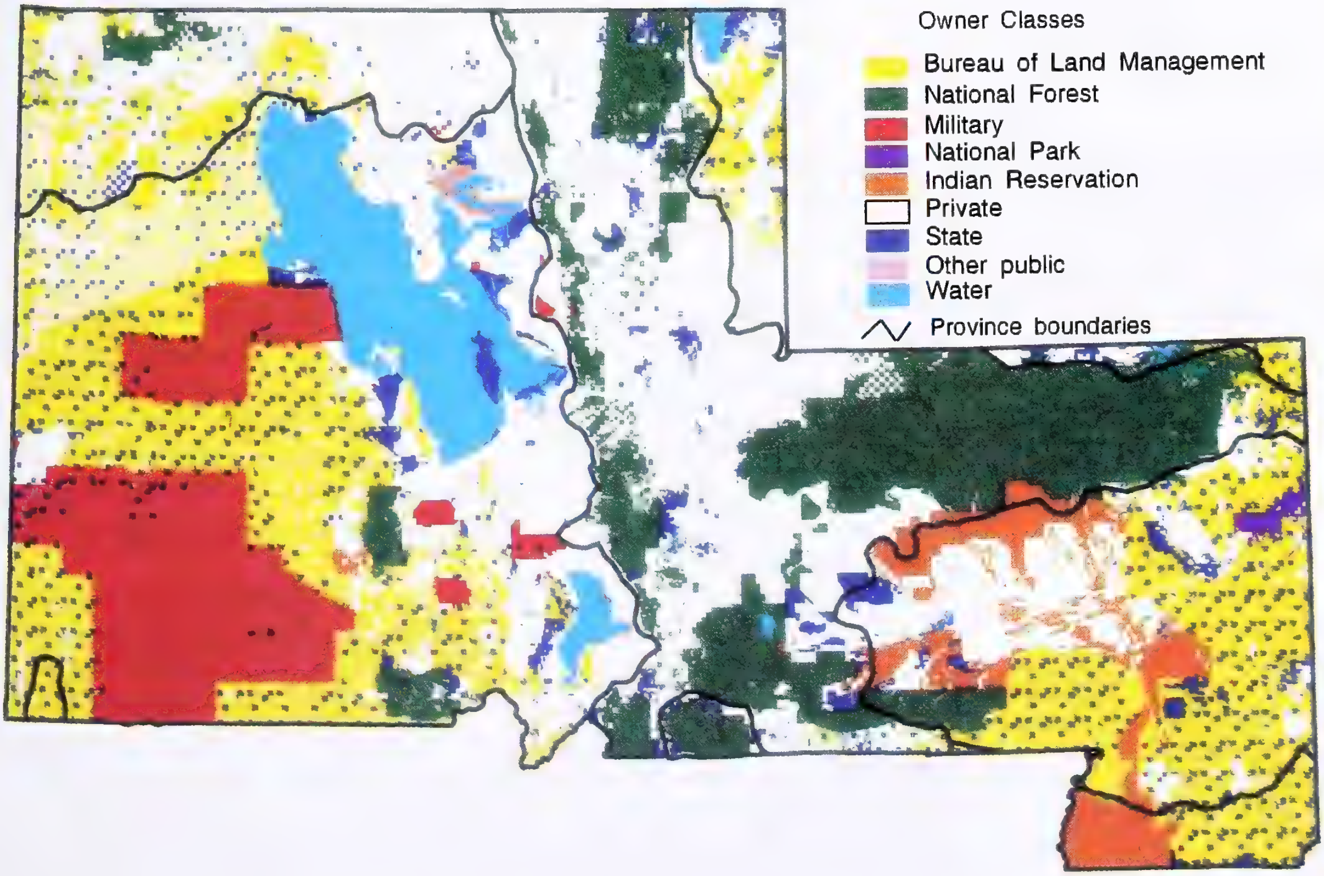

Figure 11—Land ownership by owner class in northern Utah.

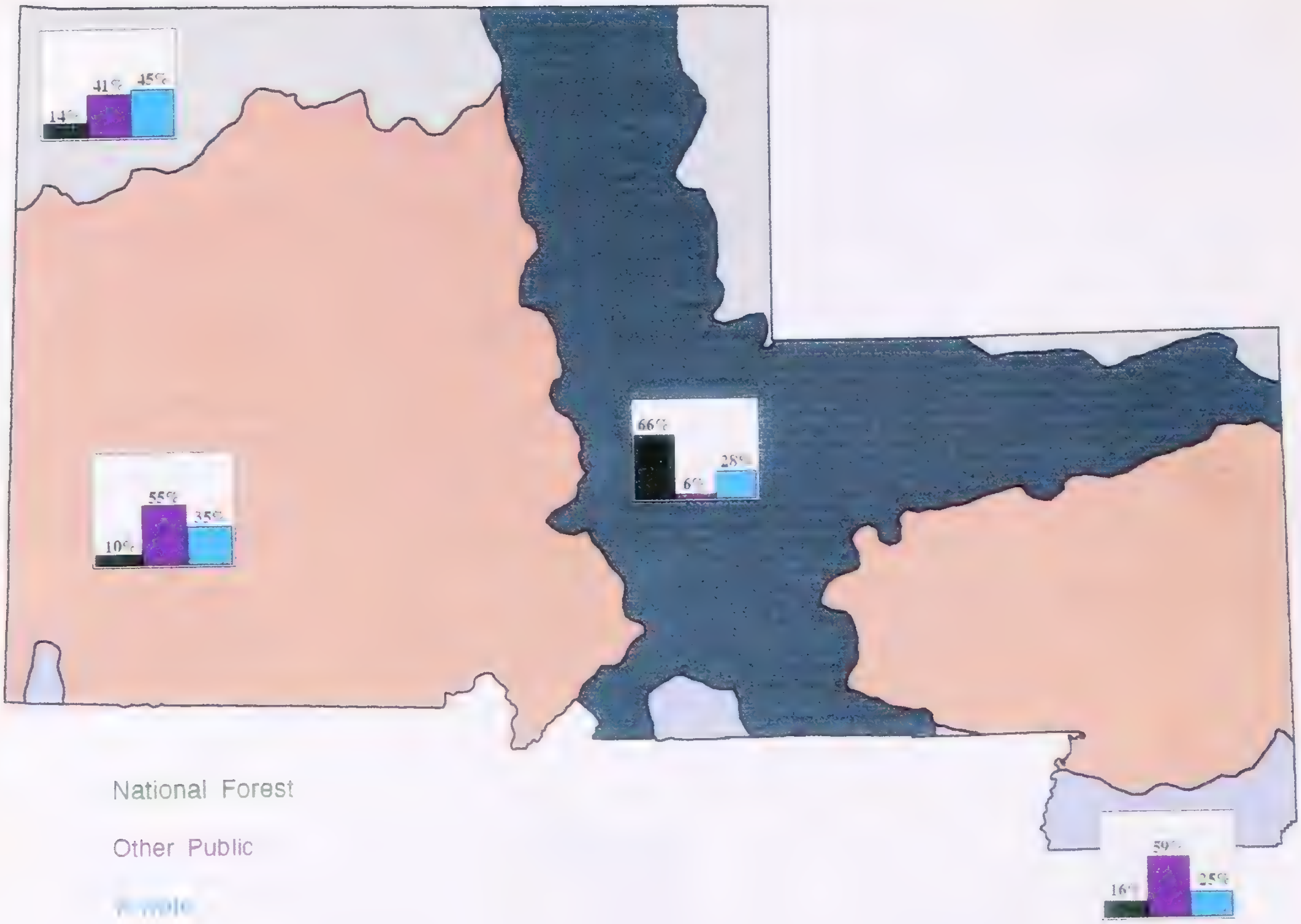

Figure 12—Distribution of forest land ownership by broad owner group and province in northern Utah.

nearest improved road, compared with 10 percent in the Southern Rockies Province, 7 percent in the Semidesert Province, and 6 percent in the Desert Province (fig. 13). On the other hand, 30 percent of forest land in the Desert Province is less than ½ mile from an improved road, compared to 27 percent in the Southern Rockies Province, 23 percent in the Semidesert Province, and 17 percent in the Nevada-Utah Mountains Province. Figure 14 shows the distribution of inventory plots in northern Utah by the different distance from road categories.

Some type of wood harvesting was evident on only 17 percent of forest land in northern Utah. For this report, all types of harvesting were lumped together: fuelwood, post/pole, thinning, clearcut, and salvage. From a variable designed to determine the primary human-caused impact on a plot, it was estimated that harvesting was the predominant impact on 9 percent of forest land in northern Utah, with a slightly higher percent (10) on Southern Rockies Province forest land, and a slightly lower percent (6) on forest land in the Desert, Semidesert, and Nevada-Mountains Provinces.

Chaining of pinyon/juniper woodlands is a management practice that sometimes receives public criticism. However, chaining was not found to be

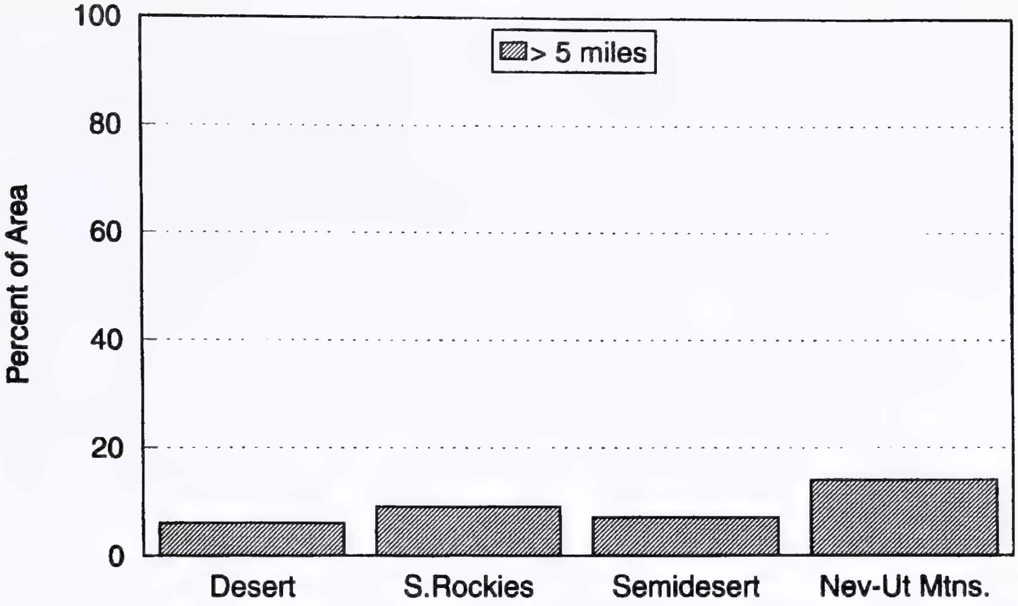

Figure 13—Percent of forest land area that is more than 5 miles from an improved road by province in northern Utah.

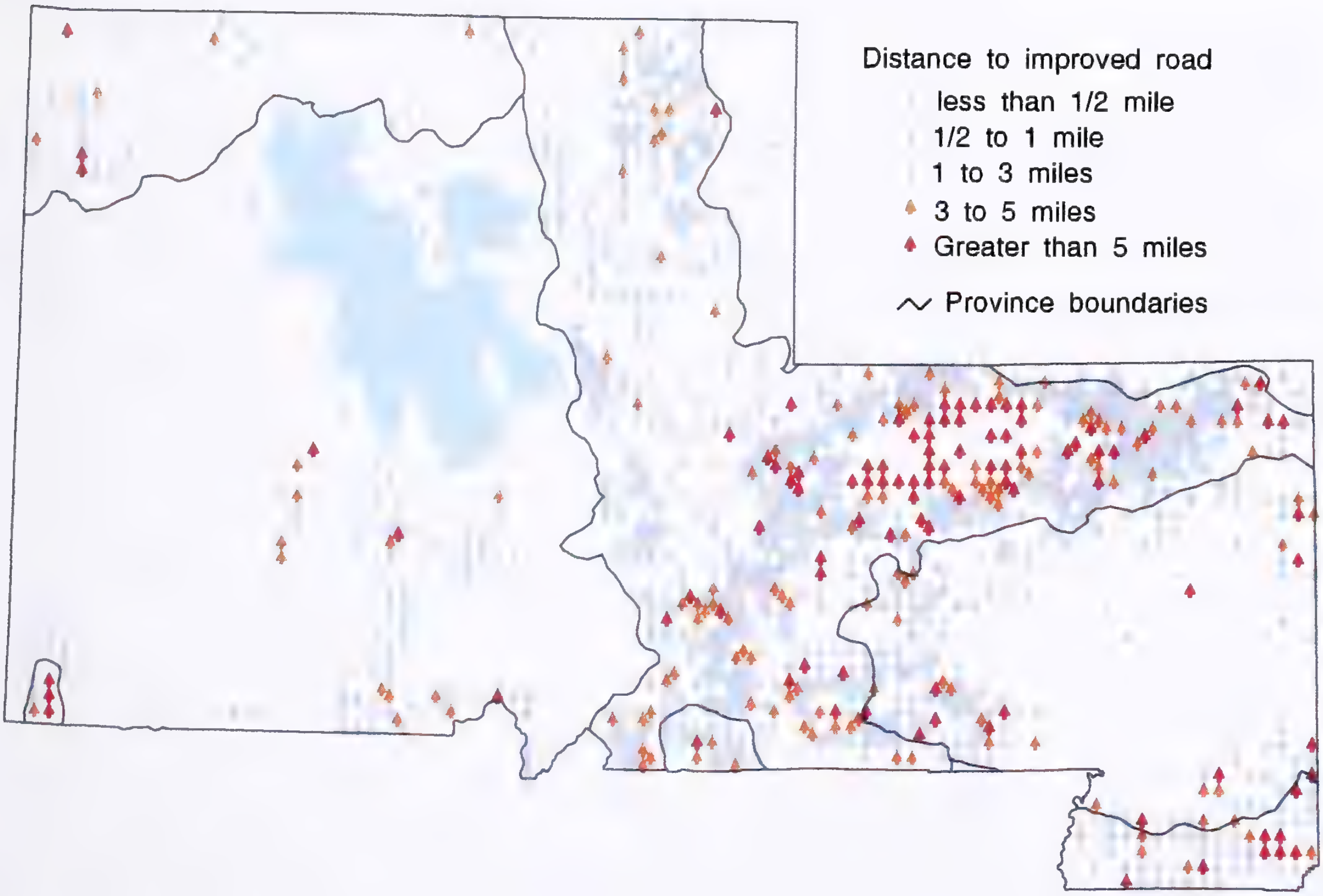

Figure 14—Distribution of field plots by distance to improved roads and by province in northern Utah.

very widespread in northern Utah. Evidence of chaining was observed on 5 percent of forest land in the Desert Province, 0.1 percent in the Southern Rockies Province, 1 percent in the Nevada-Utah Mountains Province, and was not observed on any plots in the Semidesert Province.

Grazing by domestic livestock is widespread on Utah forest lands. Domestic livestock were estimated to be the primary grazers on 11 percent of forest land in the Desert Province, 10 percent of Southern Rockies Province forest land, 14 percent of Semidesert Province forest land, and 7 percent of Nevada-Utah Mountains Province forest land. Heavy grazing by any type of animal was only observed on about 3 percent of all northern Utah forest land combined. Heavy grazing is defined as generally more than 70 percent of the graminoids or forbs being removed by grazing animals. The Semidesert Province had slightly more heavy grazing—14 percent of the area.

Evidence of use of forested sites for recreation, such as hiking or horse trails, fire rings, shell casings, and so forth, was noted by field crews. Approximately 86 percent of all plots in northern Utah had no such evidence. Nearby land use that could potentially impact the site, such as urban buildup, agriculture, major highways, other roads, lakes, or reservoirs, and the distance to them was also recorded. Only 12 percent of the forest land area in the Desert Province was estimated to be within 3 miles of the land uses, compared to 21 percent in the Southern Rockies Province, and 9 percent in both the Semidesert and Nevada-Utah Mountains Provinces. Overall, only 17 percent of northern Utah forest land is within 3 miles of the land uses.

Summary

There are significant differences in the extent and conditions of forest resources among the ecoregions of northern Utah. The Desert Province is 11 percent forested, the Southern Rockies Province is 54 percent forested, the Semidesert Province is 9 percent forested, and the Nevada-Utah Mountains Province is 71 percent forested. The most common tree found in the forest land of the Desert and Semidesert Provinces is Utah juniper, compared with Gambel oak in the Southern Rockies and Nevada-Utah Mountains Provinces. The most commonly encountered shrub in the forest land of the Desert and Semidesert Provinces is big sagebrush. In the forests of both the Southern Rockies and Nevada-Utah Mountain Provinces, the most common shrub is mountain snowberry. Average total live tree biomass is estimated to be 14.5 tons per acre in the Desert Province, 30.2 tons per acre in the Southern Rockies Province, 13.8 tons per acre in the Semidesert Province, and 21.8 tons per acre in the Nevada-Utah Mountains Province. The most abundant habitat type series in the timberland of the Desert and Nevada-Utah Mountains Provinces is Douglas-fir, and of the Southern Rockies and Semidesert Provinces is subalpine fir. Net annual growth for all species combined was greatest in the Southern Rockies Province at 13.4 cubic ft per acre, compared with 3.1 cubic ft per acre in the Desert Province, 6.4 cubic ft per acre in the Semidesert Province, and 5.0 cubic ft per acre for the Nevada-Utah Mountains Province. Annual mortality for all species combined was greatest in the Southern Rockies Province with 17.3 cubic ft per acre, compared to 2.8 cubic ft per acre in the Desert Province and 5.7 cubic ft per acre in the Nevada-Utah Mountains Province. No mortality was observed in the Semidesert Province. The Southern Rockies Province has more snags per acre greater than 5 inches diameter than the other ecoregions, but the

Nevada-Utah Mountains Province has the greatest number per acre of snags greater than 21 inches in diameter. The largest owner of forest land in the Desert Province is other public, compared to NFS in the Southern Rockies Province, private in the Semidesert Province, and other public in the Nevada-Utah Mountains. Percentage of forest land more than 5 miles from the nearest improved road ranges from 6 percent in the Desert Province to 14 percent in the Nevada-Utah Mountains. Timber harvest, livestock grazing, and recreational impacts were significant on less than 20 percent of the land in any province.

As it becomes available, information from southern Utah and surrounding States will be combined with the information presented in this report for complete ecoregion summaries. These types of summaries of forest inventory data by ecoregion will facilitate an ecological approach to planning and monitoring at landscape level scales across all ownerships.

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Apendix A: Common and Scientific Plant Species Names

Tree Species

Aspen (*Populus tremuloides*)
Bigtooth maple (*Acer grandidentatum*)
Blue spruce (*Picea pungens*)
Bristlecone pine (*Pinus aristata*)
Common pinyon (*Pinus edulis*)
Curlleaf mountain mahogany (*Cercocarpus ledifolius*)
Douglas-fir (*Pseudotsuga menziesii*)
Engelmann spruce (*Picea engelmannii*)
Gambel oak (*Quercus gambelii*)
Limber pine (*Pinus flexilis*)
Lodgepole pine (*Pinus contorta*)
Other poplar (*Populus* spp.)
Ponderosa pine (*Pinus ponderosa*)
Rocky Mountain juniper (*Juniperus scopulorum*)
Rocky Mountain maple (*Acer glabrum*)
Singleleaf pinyon (*Pinus monophylla*)
Subalpine fir (*Abies lasiocarpa*)
True mountain mahogany (*Cercocarpus montanus*)
Utah juniper (*Juniperus osteosperma*)
White fir (*Abies concolor*)

Shrub Species

Antelope bitterbrush (*Purshia tridentata*)
Big sagebrush (*Artemisia tridentata*)
Black sagebrush (*Artemisia nova*)
Boxleaf myrtle (*Pachystima myrsinites*)
Common chokecherry (*Prunus virginiana*)
Common juniper (*Juniperus communis*)
Curlleaf mountain mahogany (*Cercocarpus ledifolius*)
Gooseberry currant (*Ribes montigenum*)
Green rabbitbrush (*Chrysothamnus viscidiflorus*)
Grouse whortleberry (*Vaccinium scoparium*)
Kinnikinnick (*Arctostaphylos uva-ursi*)
Low sagebrush (*Artemisia arbuscula*)
Mallow ninebark (*Physocarpus malvaceus*)
Mountain snowberry (*Symphoricarpos oreophilus*)
Oregon grape (*Mahonia repens*)
Plains prickly-pear (*Opuntia polyacantha*)
Saskatoon serviceberry (*Amelanchier alnifolia*)
True mountain mahogany (*Cercocarpus montanus*)
Utah serviceberry (*Amelanchier utahensis*)

Forb Species

Arrowleaf balsamroot (*Balsamorhiza sagittata*)
Common yarrow (*Achillea millefolium*)
Fendler's meadowrue (*Thalictrum fendleri*)
Heartleaf arnica (*Arnica cordifolia*)
Mountain sweetcicely (*Osmorhiza berteroi*)
Smalleaf pussytoes (*Antennaria parvifolia*)
Twolobe speedwell (*Veronica biloba*)

Weedy milkvetch (*Astragalus miser*)
Western coneflower (*Rudbeckia occidentalis*)

Grass Species

Blue wildrye (*Elymus glaucus*)
Bluebunch wheatgrass (*Pseudoroegneria spicata*)
Bulbous bluegrass (*Poa bulbosa*)
California brome (*Bromus carinatus*)
Cheatgrass (*Bromus tectorum*)
Crested wheatgrass (*Agropyron cristatum*)
Elk sedge (*Carex geyeri*)
Idaho fescue (*Festuca idahoensis*)
Indian ricegrass (*Oryzopsis hymenoides*)
Kentucky bluegrass (*Poa pratensis*)
Mountain brome (*Bromus carinatus*)
Ross sedge (*Carex rossii*)
Sandberg bluegrass (*Poa secunda*)
Slender wheatgrass (*Elymus trachycaulus*)

Apendix B: Forest Survey Tables

Table 1–Number of live trees on forest land by province, species, and diameter class in northern Utah, 1993.

Species	Diameter class (inches)														
	1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	Total
	Thousand trees															
Desert																
White fir	163	790	203	610	119	216	–	27	13	–	27	–	–	–	–	2,168
Subalpine fir	2,246	1,250	–	484	274	254	142	256	–	34	26	22	20	–	–	5,007
Utah juniper[1]	39,988	19,263	21,117	18,338	13,580	11,822	9,990	9,022	6,401	3,401	2,626	1,866	1,236	794	1,529	160,975
Rocky Mountain juniper[1]	–	75	61	–	54	–	–	–	17	–	–	–	–	–	–	207
Engelmann spruce	–	–	–	–	154	–	–	–	–	–	–	–	–	–	–	154
Common pinyon[1]	19,148	7,261	6,539	5,886	4,707	3,279	3,048	1,885	1,493	705	347	437	38	17	–	54,788
Limber pine	–	–	38	–	39	36	20	16	–	25	–	–	–	–	–	174
Singleleaf pinyon[1]	3,043	2,601	2,182	1,767	1,087	492	211	65	79	18	–	–	–	–	–	11,546
Douglas-fir	3,428	2,953	1,670	1,425	580	527	355	309	257	164	182	23	36	9	16	11,934
Softwood total	68,015	34,194	31,811	28,510	20,593	16,627	13,766	11,580	8,259	4,347	3,208	2,348	1,330	820	1,545	246,953
Rocky Mountain maple[1]	1,975	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1,975
Bigtooth maple[1]	357	–	48	–	–	–	–	–	–	–	–	–	–	–	–	405
Curlleaf mtn. mahogany[1]	2,121	1,420	1,796	1,684	1,296	787	388	57	317	157	56	–	–	–	–	10,080
Aspen	9,416	2,696	1,597	2,404	1,079	101	81	–	–	–	–	–	–	–	–	17,373
Other poplar	–	–	–	35	–	35	36	26	22	–	–	46	10	8	11	228
Gambel oak[1]	11,129	6,669	2,685	1,999	145	–	–	–	–	–	–	–	–	–	–	22,627
Hardwood total	24,999	10,785	6,126	6,122	2,519	922	505	83	339	157	56	46	10	8	11	52,687
All species	93,014	44,978	37,937	34,631	23,112	17,549	14,271	11,663	8,598	4,504	3,264	2,394	1,340	828	1,556	299,640
Southern Rockies																
White fir	10,401	3,857	3,227	1,506	1,367	999	578	441	466	194	163	67	46	33	83	23,429
Subalpine fir	117,765	37,181	19,664	11,456	6,999	3,290	1,852	1,086	866	498	297	120	129	65	38	201,305
Utah juniper[1]	3,359	2,430	1,481	2,766	1,731	1,747	1,705	1,427	799	716	501	264	331	110	391	19,756
Rocky Mountain juniper[1]	2,974	2,999	1,968	1,480	776	623	166	108	49	92	16	–	20	5	–	11,275
Engelmann spruce	32,346	21,849	11,584	10,320	6,811	6,359	4,426	2,906	1,359	1,631	836	517	240	134	198	101,516
Blue spruce	1,469	732	390	337	45	55	46	31	–	21	17	7	13	6	7	3,176
Common pinyon[1]	1,956	3,481	2,722	1,688	1,149	760	486	499	180	183	174	80	38	27	30	13,454
Lodgepole pine	104,610	75,424	46,297	28,544	17,325	8,578	4,538	2,039	1,195	589	157	33	23	5	8	289,366
Limber pine	361	885	132	318	–	43	78	156	113	50	57	30	6	8	56	2,292
Ponderosa pine	1,821	531	1,889	1,173	234	333	125	309	58	84	81	53	39	45	20	6,797
Douglas-fir	19,848	18,002	10,665	8,013	5,612	5,360	4,027	2,992	1,895	1,242	864	557	356	199	390	80,024
Softwood total	296,911	167,372	100,019	67,601	42,050	28,146	18,026	11,993	6,980	5,301	3,162	1,729	1,239	638	1,222	752,389
Rocky Mountain maple[1]	15,342	5,255	2,190	799	505	121	60	–	–	–	–	–	–	–	–	24,272
Bigtooth maple[1]	139,563	34,265	14,839	4,276	2,083	1,172	910	222	350	40	–	–	–	–	–	197,720
Curlleaf mtn. mahogany[1]	7,801	4,202	4,834	2,955	1,631	1,109	501	98	118	103	–	–	–	–	–	23,352
Aspen	174,029	118,884	80,439	42,724	15,459	5,868	2,205	532	138	32	13	7	–	–	–	440,330
Other poplar	–	–	–	–	32	28	27	31	–	22	18	23	–	10	19	210
Gambel oak[1]	508,752	99,574	25,706	3,282	783	110	–	–	–	–	–	–	–	–	–	638,208
Hardwood total	845,488	262,180	128,008	54,037	20,493	8,408	3,703	882	606	197	31	30	–	10	19	1,324,092
All species	1,142,399	429,552	228,027	121,638	62,543	36,555	21,730	12,875	7,586	5,498	3,193	1,758	1,239	649	1,241	2,076,481
Semidesert																
Subalpine fir	2,036	2,036	368	61	231	213	–	44	–	–	–	–	–	–	–	4,990
Utah juniper[1]	12,332	7,952	6,936	4,462	3,535	2,439	1,933	1,251	756	719	376	299	73	198	339	43,599
Rocky Mountain juniper[1]	–	–	–	87	–	–	–	–	11	9	–	–	–	–	–	107
Engelmann spruce	–	–	–	–	39	32	–	–	29	23	39	–	–	–	–	163
Common pinyon[1]	1,290	286	29	148	–	–	–	–	–	–	–	–	28	–	–	1,780
Lodgepole pine	–	–	76	57	–	–	–	–	–	–	–	–	–	–	–	133
Limber pine	–	–	617	–	–	–	–	–	–	12	–	–	–	–	3	631
Ponderosa pine	–	–	–	–	–	–	–	–	11	–	–	–	–	–	–	11
Singleleaf pinyon[1]	2,130	878	642	682	285	114	113	170	56	–	113	–	–	–	–	5,184
Douglas-fir	1,057	1,057	579	325	106	128	104	52	42	36	–	6	7	5	–	3,501
Softwood total	18,845	12,209	9,248	5,822	4,195	2,925	2,150	1,517	906	798	529	305	107	202	342	60,099
Bigtooth maple[1]	–	–	143	95	48	143	–	–	–	–	–	–	–	–	–	428
Curlleaf mtn. mahogany[1]	–	–	253	179	66	–	–	–	–	–	–	–	–	–	–	499
Aspen	367	1,837	767	254	86	127	–	–	–	–	–	–	–	–	–	3,439
Hardwood total	367	1,837	1,163	528	200	270	–	–	–	–	–	–	–	–	–	4,366
All species	19,212	14,046	10,411	6,351	4,395	3,196	2,150	1,517	906	798	529	305	107	202	342	64,465

(con.)

Table 1 (Con.)

Species	Diameter class (inches) 1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	Total
	- *Thousand trees* -															
Nevada-Utah Mountains																
White fir	221	1,483	–	273	241	129	76	48	108	13	12	28	–	–	–	2,632
Subalpine fir	890	593	–	256	263	89	24	39	16	–	22	–	–	–	–	2,191
Utah juniper[1]	4,669	3,163	3,749	2,697	2,693	2,598	2,609	1,748	1,260	1,101	841	554	436	116	813	29,049
Rocky Mountain juniper[1]	2,325	2,259	997	1,083	1,056	479	102	119	91	37	22	21	–	–	–	8,593
Bristlecone pine	–	–	–	–	–	–	–	–	38	–	–	–	–	–	–	38
Common pinyon[1]	7,396	7,718	5,185	4,313	3,857	3,214	2,215	1,346	695	474	419	332	290	243	161	37,858
Limber pine	–	–	–	–	–	–	27	22	–	–	–	9	–	–	–	58
Ponderosa pine	–	–	–	–	–	–	–	–	–	–	26	–	–	–	–	26
Singleleaf pinyon[1]	427	405	408	181	174	57	57	–	–	57	–	–	–	–	–	1,766
Douglas-fir	2,222	563	1,468	902	464	627	405	167	54	181	26	25	43	–	5	7,153
Softwood total	18,150	16,184	11,808	9,705	8,748	7,193	5,515	3,488	2,262	1,863	1,369	970	770	359	980	89,365
Bigtooth maple[1]	2,239	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2,239
Curlleaf mtn. mahogany[1]	2,042	574	832	1,278	383	79	159	–	–	–	–	–	–	–	–	5,347
True mtn. mahogany[1]	723	–	–	–	–	–	–	–	–	–	–	–	–	–	–	723
Aspen	1,218	1,222	1,450	306	189	169	37	78	23	10	–	6	–	–	–	4,710
Gambel oak[1]	53,071	11,594	1,444	389	200	–	–	–	–	–	–	–	–	–	–	66,697
Hardwood total	59,293	13,390	3,726	1,973	772	248	196	78	23	10	–	6	–	–	–	79,716
All species	77,443	29,574	15,534	11,677	9,520	7,441	5,711	3,566	2,286	1,874	1,369	976	770	359	980	169,081
All Provinces																
White fir	10,785	6,130	3,430	2,389	1,727	1,344	654	516	587	207	202	95	46	33	83	28,228
Subalpine fir	122,937	41,060	20,033	12,256	7,766	3,846	2,018	1,425	882	532	345	142	149	65	38	213,493
Utah juniper[1]	60,348	32,808	33,283	28,262	21,539	18,606	16,237	13,448	9,215	5,937	4,344	2,983	2,076	1,218	3,072	253,379
Rocky Mountain juniper[1]	5,299	5,334	3,026	2,651	1,886	1,102	267	227	168	138	38	21	20	5	–	20,182
Engelmann spruce	32,346	21,849	11,584	10,320	7,004	6,391	4,426	2,906	1,389	1,654	875	517	240	134	198	101,832
Blue spruce	1,469	732	390	337	45	55	46	31	–	21	17	7	13	6	7	3,176
Bristlecone pine	–	–	–	–	–	–	–	–	38	–	–	–	–	–	–	38
Common pinyon[1]	29,790	18,746	14,475	12,034	9,713	7,253	5,749	3,730	2,368	1,362	940	849	394	287	191	107,881
Lodgepole pine	104,610	75,424	46,373	28,602	17,325	8,578	4,538	2,039	1,195	589	157	33	23	5	8	289,499
Limber pine	361	885	786	318	39	79	125	194	113	87	57	39	6	8	59	3,155
Ponderosa pine	1,821	531	1,889	1,173	234	333	125	309	69	84	107	53	39	45	20	6,834
Singleleaf pinyon[1]	5,600	3,884	3,233	2,630	1,546	663	382	235	135	75	113	–	–	–	–	18,496
Douglas-fir	26,555	22,575	14,382	10,666	6,761	6,641	4,891	3,520	2,249	1,622	1,072	611	442	213	411	102,612
Softwood total	401,920	229,959	152,885	111,638	75,586	54,891	39,458	28,578	18,407	12,310	8,268	5,351	3,446	2,020	4,089	1,148,806
Rocky Mountain maple[1]	17,317	5,255	2,190	799	505	121	60	–	–	–	–	–	–	–	–	26,247
Bigtooth maple[1]	142,159	34,265	15,030	4,372	2,131	1,315	910	222	350	40	–	–	–	–	–	200,792
Curlleaf mtn. mahogany[1]	11,964	6,196	7,715	6,096	3,377	1,975	1,048	155	435	260	56	–	–	–	–	39,278
True mtn. mahogany[1]	723	–	–	–	–	–	–	–	–	–	–	–	–	–	–	723
Aspen	185,031	124,639	84,253	45,688	16,813	6,265	2,323	610	161	43	13	13	–	–	–	465,851
Other poplar	–	–	–	35	32	63	63	57	22	22	18	69	10	18	29	438
Gambel oak[1]	572,952	117,837	29,836	5,671	1,127	110	–	–	–	–	–	–	–	–	–	727,532
Hardwood total	930,147	288,191	139,024	62,660	23,984	9,849	4,404	1,043	969	364	87	82	10	18	29	1,460,861
All species[2]	1,332,067	518,150	291,909	174,297	99,570	64,740	43,862	29,621	19,376	12,674	8,355	5,433	3,456	2,039	4,118	2,609,667

[1] Diameter taken at root collar rather than at breast height

[2] On this and all subsequent tables, data may not sum to totals due to rounding or truncating

Table 2–Total live tree biomass on forest land by province, species, and diameter class in northern Utah, 1993.

Species	Diameter class (inches)															Total
	1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	
	Thousand tons															
Desert																
White fir	1	17	14	66	22	58	–	18	12	–	33	–	–	–	–	241
Subalpine fir	12	27	–	36	44	64	51	137	–	26	28	25	29	–	–	480
Utah juniper[1]	188	163	416	670	743	1,003	1,141	1,323	1,303	784	800	678	569	405	1,014	11,198
Rocky Mountain juniper[1]	–	1	3	–	4	–	–	–	3	–	–	–	–	–	–	11
Engelmann spruce	–	–	–	–	21	–	–	–	–	–	–	–	–	–	–	21
Common pinyon[1]	94	77	155	287	384	438	578	414	448	251	129	253	13	10	–	3,531
Limber pine	–	–	1	–	6	8	7	9	–	19	–	–	–	–	–	51
Singleleaf pinyon[1]	16	28	68	95	108	91	50	14	30	8	–	–	–	–	–	507
Douglas-fir	19	72	84	127	119	132	142	165	188	167	186	32	61	21	42	1,556
Softwood total	331	384	740	1,282	1,451	1,793	1,969	2,079	1,984	1,255	1,176	986	673	436	1,056	17,595
Rocky mountain maple[1]	11	–	–	–	–	–	–	–	–	–	–	–	–	–	–	11
Bigtooth maple[1]	2	–	1	–	–	–	–	–	–	–	–	–	–	–	–	3
Curlleaf mtn. mahogany[1]	2	15	48	103	135	141	101	21	164	109	45	–	–	–	–	885
Aspen	19	26	47	195	185	33	36	–	–	–	–	–	–	–	–	541
Other poplar	–	–	–	2	–	5	8	8	11	–	–	46	11	11	19	121
Gambel oak[1]	33	96	140	177	30	–	–	–	–	–	–	–	–	–	–	476
Hardwood total	68	137	237	477	350	179	145	30	176	109	45	46	11	11	19	2,038
All species	398	521	977	1,759	1,800	1,972	2,115	2,109	2,160	1,364	1,222	1,032	684	446	1,075	19,633
Southern Rockies																
White fir	57	83	127	143	237	303	242	256	340	189	193	104	67	60	234	2,635
Subalpine fir	648	799	817	1,053	1,245	923	739	626	635	440	321	169	209	118	101	8,844
Utah juniper[1]	17	26	34	122	114	189	238	261	194	200	200	118	167	65	318	2,263
Rocky Mountain juniper[1]	15	34	54	69	66	107	28	25	22	30	7	–	11	5	–	472
Engelmann spruce	194	470	461	887	1,087	1,649	1,704	1,572	1,029	1,469	936	690	378	269	514	13,310
Blue spruce	9	16	14	28	4	14	22	16	–	23	21	10	24	12	20	233
Common pinyon[1]	9	35	73	77	107	105	99	119	47	53	79	45	26	18	23	915
Lodgepole pine	523	1,508	2,788	3,387	3,688	2,842	2,044	1,230	885	539	165	43	33	12	17	19,706
Limber pine	2	18	4	28	–	12	24	66	60	30	47	34	5	12	117	458
Ponderosa pine	9	11	88	82	33	80	40	167	44	91	107	95	80	112	68	1,107
Douglas-fir	109	441	549	937	1,122	1,776	1,938	2,119	1,767	1,430	1,217	944	729	448	1,256	16,781
Softwood total	1,591	3,440	5,011	6,813	7,702	8,002	7,119	6,458	5,022	4,493	3,292	2,250	1,729	1,132	2,670	66,724
Rocky Mountain maple[1]	44	91	116	92	103	32	20	–	–	–	–	–	–	–	–	496
Bigtooth maple[1]	865	587	698	415	292	239	303	89	221	32	–	–	–	–	–	3,742
Curlleaf mtn. mahogany[1]	20	41	136	154	170	191	129	32	65	72	–	–	–	–	–	1,010
Aspen	348	1,129	2,417	3,524	2,563	1,631	885	294	102	31	15	9	–	–	–	12,948
Other poplar	–	–	–	–	5	6	9	17	–	17	20	29	–	20	35	157
Gambel oak[1]	8,293	1,397	1,113	284	95	33	–	–	–	–	–	–	–	–	–	11,215
Hardwood total	9,569	3,246	4,480	4,469	3,228	2,133	1,345	432	388	152	35	38	–	20	35	29,569
All species	11,160	6,686	9,491	11,282	10,930	10,135	8,464	6,889	5,410	4,645	3,327	2,288	1,729	1,151	2,704	96,292
Semidesert																
Subalpine fir	11	44	9	6	40	50	–	21	–	–	–	–	–	–	–	181
Utah juniper[1]	61	68	133	175	203	206	220	202	152	155	103	117	32	109	229	2,166
Rocky Mountain juniper[1]	–	–	–	3	–	–	–	–	2	3	–	–	–	–	–	9
Engelmann spruce	–	–	–	–	9	10	–	–	23	24	45	–	–	–	–	112
Common pinyon[1]	6	2	(2)	4	–	–	–	–	–	–	–	–	16	–	–	28
Lodgepole pine	–	–	3	3	–	–	–	–	–	–	–	–	–	–	–	7
Limber pine	–	–	20	–	–	–	–	–	–	8	–	–	–	–	9	37
Ponderosa pine	–	–	–	–	–	–	–	–	6	–	–	–	–	–	–	6
Singleleaf pinyon[1]	12	8	16	34	23	21	20	42	17	–	55	–	–	–	–	247
Douglas-fir	6	26	27	37	21	43	45	34	32	32	–	6	11	10	–	329
Softwood total	96	148	208	262	296	330	285	299	232	222	203	123	59	119	237	3,120
Bigtooth maple[1]	–	–	6	6	7	27	–	–	–	–	–	–	–	–	–	46
Curlleaf mtn. mahogany[1]	–	–	8	9	8	–	–	–	–	–	–	–	–	–	–	26
Aspen	1	17	18	22	14	31	–	–	–	–	–	–	–	–	–	103
Hardwood total	1	17	32	38	29	58	–	–	–	–	–	–	–	–	–	174
All species	96	165	240	300	325	388	285	299	232	222	203	123	59	119	237	3,294

(con.)

Table 2 (Con.)

Species	Diameter class (inches) 1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	Total
	Thousand tons															
Nevada-Utah Mountains																
White fir	1	32	–	32	38	39	31	28	80	12	12	35	–	–	–	340
Subalpine fir	5	13	–	17	41	22	10	26	13	–	28	–	–	–	–	175
Utah juniper[1]	22	28	80	118	176	268	367	308	285	303	284	204	226	63	541	3,273
Rocky Mountain juniper[1]	16	29	36	59	94	67	17	36	33	17	13	11	–	–	–	427
Bristlecone pine	–	–	–	–	–	–	–	–	28	–	–	–	–	–	–	28
Common pinyon[1]	37	68	132	218	379	451	458	367	209	180	232	214	231	215	154	3,544
Limber pine	–	–	–	–	–	–	9	9	–	–	–	11	–	–	–	29
Ponderosa pine	–	–	–	–	–	–	–	–	–	–	33	–	–	–	–	33
Singleleaf pinyon[1]	3	4	10	8	17	7	11	–	–	29	–	–	–	–	–	89
Douglas-fir	12	14	56	77	67	174	156	90	42	198	25	40	58	–	15	1,024
Softwood total	96	187	314	529	811	1,028	1,058	865	691	739	627	515	515	278	710	8,964
Bigtooth maple[1]	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3
Curlleaf mtn. mahogany[1]	5	6	17	71	38	15	43	–	–	–	–	–	–	–	–	195
True mtn. mahogany[1]	([2])	–	–	–	–	–	–	–	–	–	–	–	–	–	–	([2])
Aspen	2	12	39	27	37	46	19	48	18	9	–	8	–	–	–	266
Gambel oak[1]	303	145	51	35	26	–	–	–	–	–	–	–	–	–	–	559
Hardwood total	314	162	107	133	101	61	61	48	18	9	–	8	–	–	–	1,023
All species	410	349	421	662	912	1,090	1,120	913	709	748	627	524	515	278	710	9,987
All Provinces																
White fir	59	132	141	241	297	400	272	302	432	201	237	139	67	60	234	3,216
Subalpine fir	676	883	826	1,112	1,370	1,059	801	809	648	467	377	194	239	118	101	9,680
Utah juniper[1]	289	285	662	1,085	1,236	1,666	1,966	2,094	1,934	1,442	1,387	1,117	994	642	2,102	18,900
Rocky Mountain juniper[1]	30	63	93	131	164	174	45	62	60	50	20	11	11	5	–	918
Engelmann spruce	194	470	461	887	1,118	1,660	1,704	1,572	1,051	1,493	981	690	378	269	514	13,443
Blue spruce	9	16	14	28	4	14	22	16	–	23	21	10	24	12	20	233
Bristlecone pine	–	–	–	–	–	–	–	–	28	–	–	–	–	–	–	28
Common pinyon[1]	146	181	360	586	869	994	1,135	900	705	484	440	512	286	243	178	8,019
Lodgepole pine	523	1,508	2,791	3,391	3,688	2,842	2,044	1,230	885	539	165	43	33	12	17	19,712
Limber pine	2	18	25	28	6	20	41	84	60	57	47	45	5	12	126	574
Ponderosa pine	9	11	88	82	33	80	40	167	50	91	141	95	80	112	68	1,147
Singleleaf pinyon[1]	31	40	94	137	147	119	80	56	48	36	55	–	–	–	–	843
Douglas-fir	146	553	716	1,178	1,329	2,125	2,281	2,408	2,029	1,826	1,428	1,021	859	479	1,313	19,691
Softwood total	2,114	4,159	6,274	8,886	10,261	11,153	10,431	9,701	7,930	6,709	5,299	3,875	2,975	1,964	4,673	96,403
Rocky Mountain maple[1]	55	91	116	92	103	32	20	–	–	–	–	–	–	–	–	508
Bigtooth maple[1]	869	587	704	422	299	266	303	89	221	32	–	–	–	–	–	3,793
Curlleaf mtn. mahogany[1]	27	62	209	337	351	347	273	53	229	181	45	–	–	–	–	2,115
True mtn. mahogany[1]	([2])	–	–	–	–	–	–	–	–	–	–	–	–	–	–	([2])
Aspen	370	1,184	2,522	3,769	2,800	1,741	940	342	120	40	15	17	–	–	–	13,858
Other poplar	–	–	–	2	5	11	16	25	11	17	20	75	11	30	53	279
Gambel oak[1]	8,630	1,637	1,305	496	150	33	–	–	–	–	–	–	–	–	–	12,251
Hardwood total	9,951	3,562	4,856	5,117	3,707	2,431	1,552	510	581	270	80	92	11	30	53	32,804
All species	12,065	7,720	11,129	14,003	13,968	13,584	11,983	10,210	8,511	6,979	5,379	3,967	2,986	1,995	4,726	129,207

[1] Diameter taken at root collar rather than at breast height

[2] Less than 500 cubic feet

Table 3—Percent of timberland area in each province that is accounted for by each habitat type series in northern Utah, 1993.

Habitat type series	Province			
	Desert	Southern Rockies	Semidesert	Nevada-Utah Mountains
	Percent			
White fir	30	5	—	12
Subalpine fir	8	35	67	3
Engelmann spruce	—	7	—	—
Blue spruce	—	([1])	—	—
Lodgepole pine	—	7	—	—
Limber pine	7	1	—	—
Ponderosa pine	—	2	—	—
Douglas-fir	35	13	33	63
Aspen	20	30	—	22
Total	100	100	100	100

[1] Less than 1 percent.

Table 4—Percent distribution of growing-stock trees on timberland in each province, by habitat type series and species in northern Utah, 1993.

Habitat type series	Species											
	White fir	Subalpine fir	Engelmann spruce	Blue spruce	Bristlecone pine	Lodgepole pine	Limber pine	Ponderosa pine	Douglas-fir	Aspen	Other poplar	Total
	Percent											
Desert												
White fir	19	—	—	—	—	—	—	—	20	61	—	100
Subalpine fir	—	77	—	—	—	—	2	—	12	9	—	100
Limber pine	—	—	—	—	—	—	6	—	94	—	—	100
Douglas-fir	3	—	—	—	—	—	—	—	96	1	—	100
Aspen	—	6	—	—	—	—	—	—	—	93	1	100
Southern Rockies												
White fir	45	—	—	—	—	—	1	—	25	29	—	100
Subalpine fir	—	40	15	—	—	22	—	—	4	19	—	100
Engelmann spruce	—	4	49	—	—	45	—	—	1	1	—	100
Blue spruce	—	—	—	96	—	—	—	1	3	—	—	100
Lodgepole pine	—	2	1	—	—	91	—	1	—	5	—	100
Limber pine	—	—	—	—	—	—	49	—	51	—	—	100
Ponderosa pine	—	—	—	—	—	1	—	80	3	16	—	100
Douglas-fir	3	1	—	—	—	5	1	1	57	32	—	100
Aspen	1	4	1	—	—	9	—	—	2	83	—	100
Semidesert												
Subalpine fir	—	56	2	—	—	—	—	—	3	39	—	100
Douglas-fir	—	3	—	—	—	—	17	—	80	—	—	100
Nevada-Utah Mountains												
White fir	88	—	—	—	1	—	2	—	9	—	—	100
Subalpine fir	—	31	—	—	—	—	—	—	—	69	—	100
Douglas-fir	—	—	—	—	—	—	—	1	99	—	—	100
Aspen	1	21	—	—	—	—	—	—	2	76	—	100

Table 5–Net annual growth of all live trees on forest land by province, species, and diameter class in northern Utah, 1992.

Species	Diameter class (inches)														Total
	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	
	Thousand cubic feet														
Desert															
White fir	XXXXX[1]	66	142	43	146	–	20	13	–	7	–	–	–	–	436
Subalpine fir	XXXXX	–73	87	153	122	74	153	–	–59	7	15	15	–	–	493
Utah juniper[2]	209	230	294	257	313	282	191	131	115	100	75	56	41	79	2,373
Rocky Mountain juniper[2]	(3)	2	–	2	–	–	–	1	–	–	–	–	–	–	5
Engelmann spruce	XXXXX	–	–	4	–	–	–	–	–	–	–	–	–	–	4
Common pinyon[2]	146	118	139	88	190	172	–49	102	56	27	42	2	1	–	1,036
Limber pine	XXXXX	3	–	10	6	9	11	–	15	–	–	–	–	–	54
Singleleaf pinyon[2]	39	61	75	71	45	19	–135	10	2	–	–	–	–	–	186
Douglas-fir	XXXXX	267	132	156	35	90	114	10	117	95	8	–67	5	9	970
Softwood total	394	673	869	784	856	645	306	267	245	235	140	6	48	88	5,557
Bigtooth maple[2]	–	1	–	–	–	–	–	–	–	–	–	–	–	–	1
Curlleaf mtn. mahogany[2]	11	17	27	27	17	12	3	13	7	2	–	–	–	–	136
Aspen	XXXXX	121	83	96	–321	15	–460	–721	–240	–	–	–	–	–	–1,427
Other poplar	XXXXX	–	3	–	3	3	5	7	–206	–	22	4	8	–97	–249
Gambel oak[2]	86	65	70	10	–	–	–	–	–	–	–	–	–	–	232
Hardwood total	97	204	183	134	–301	29	–452	–701	–439	2	22	4	8	–97	–1,308
All species	491	877	1,051	918	556	674	–147	–434	–194	237	162	10	56	–9	4,249
Southern Rockies															
White fir	XXXXX	422	359	229	61	–4	–(3)	35	–67	123	–90	31	22	123	1,243
Subalpine fir	XXXXX	2,508	956	–1,730	–1,802	–2,822	–858	–1,287	–85	118	–787	–30	40	–242	–6,021
Utah juniper[2]	18	18	52	39	61	53	49	29	30	27	14	16	4	22	432
Rocky Mountain juniper[2]	38	32	37	33	50	11	10	6	9	1	–	2	1	–	230
Engelmann spruce	XXXXX	1,584	1,049	745	697	820	410	364	–87	–199	205	35	22	47	5,692
Blue spruce	XXXXX	182	54	7	52	18	33	–	29	22	6	–199	16	10	232
Common pinyon[2]	60	65	47	9	52	–21	31	16	11	20	8	5	3	4	310
Lodgepole pine	XXXXX	8,623	1,628	–656	522	–1,360	–1,384	–1,653	–449	69	–323	9	3	3	5,033
Limber pine	XXXXX	10	61	–	–300	28	56	44	5	37	25	1	7	–47	–73
Ponderosa pine	XXXXX	465	271	105	102	–3	154	34	55	48	50	21	34	–132	1,204
Douglas-fir	XXXXX	1,587	1,777	1,464	1,529	1,956	1,703	369	905	683	302	400	237	223	13,136
Softwood total	115	15,496	6,292	245	1,023	–1,323	203	–2,043	357	950	–589	291	390	9	21,418
Rocky Mountain maple[2]	134	73	42	38	12	5	–	–	–	–	–	–	–	–	305
Bigtooth maple[2]	1,296	354	128	–66	80	80	22	44	7	–	–	–	–	–	1,943
Curlleaf mtn. mahogany[2]	34	53	44	35	30	18	4	5	5	–	–	–	–	–	229
Aspen	XXXXX	9,668	3,674	1,998	559	102	–10	–53	–82	11	3	–	–	–	15,869
Other poplar	XXXXX	–	–	7	5	4	12	–	11	11	14	–	9	7	81
Gambel oak[2]	2,176	522	102	32	9	–	–	–	–	–	–	–	–	–	2,840
Hardwood total	3,640	10,670	3,991	2,044	695	209	28	–5	–60	22	18	–	9	7	21,268
All species	3,756	26,166	10,283	2,289	1,719	–1,114	231	–2,047	296	972	–571	291	399	17	42,686
Semidesert															
Subalpine fir	XXXXX	23	12	55	58	–	21	–	–	–	–	–	–	–	168
Utah juniper[2]	94	78	89	87	73	59	51	33	25	16	10	4	8	16	643
Rocky Mountain juniper[2]	XXXXX	–	1	–	–	–	–	1	1	–	–	–	–	–	2
Engelmann spruce	XXXXX	–	–	7	8	–	–	17	22	23	–	–	–	–	76
Common pinyon[2]	3	(3)	3	–	–	–	–	–	–	–	–	1	–	–	8
Lodgepole pine	XXXXX	(3)	1	–	–	–	–	–	–	–	–	–	–	–	1
Limber pine	XXXXX	69	–	–	–	–	–	–	5	–	–	–	–	2	77
Ponderosa pine	XXXXX	–	–	–	–	–	–	5	–	–	–	–	–	–	5
Singleleaf pinyon[2]	19	16	29	16	13	7	10	3	–	10	–	–	–	–	123
Douglas-fir	XXXXX	48	38	17	39	47	22	21	21	–	2	1	2	–	259
Softwood total	116	235	172	182	191	113	104	80	74	48	13	6	10	19	1,362
Bigtooth maple[2]	–	5	4	4	12	–	–	–	–	–	–	–	–	–	24
Curlleaf mtn. mahogany[2]	–	2	2	1	–	–	–	–	–	–	–	–	–	–	4
Aspen	XXXXX	49	37	19	34	–	–	–	–	–	–	–	–	–	138
Hardwood total	–	55	43	23	46	–	–	–	–	–	–	–	–	–	167
All species	116	290	215	205	236	113	104	80	74	48	13	6	10	19	1,529

(con.)

Table 5 (Con.)

Species	Diameter class (inches)													
	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	Total
	Thousand cubic feet														
Nevada-Utah Mountains															
White fir	XXXXX	–	13	50	73	48	31	90	11	10	20	–	–	–	345
Subalpine fir	XXXXX	–	36	75	25	24	31	18	–	12	–	–	–	–	220
Utah juniper[2]	25	37	48	53	72	76	54	40	43	34	24	21	7	40	574
Rocky Mountain juniper[2]	18	20	–4	–15	28	6	8	7	3	2	1	–	–	–	75
Bristlecone pine	XXXXX	–	–	–	–	–	–	19	–	–	–	–	–	–	19
Common pinyon[2]	112	118	94	106	107	155	95	49	40	49	34	38	29	21	1,044
Limber pine	XXXXX	–	–	–	–	3	16	–	–	–	5	–	–	–	23
Ponderosa pine	XXXXX	–	–	–	–	–	–	–	–	30	–	–	–	–	30
Singleleaf pinyon[2]	5	12	9	12	4	6	–	–	5	–	–	–	–	–	53
Douglas-fir	XXXXX	179	144	140	182	–252	–16	–([3])	–246	–468	–338	–111	–	5	–782
Softwood total	160	367	339	421	490	65	218	222	–146	–331	–255	–52	36	66	1,600
Curlleaf mtn. mahogany[2]	13	1	21	8	3	5	–	–	–	–	–	–	–	–	50
Aspen	XXXXX	280	40	53	61	–114	24	5	4	–	3	–	–	–	356
Gambel oak[2]	256	26	15	8	–	–	–	–	–	–	–	–	–	–	304
Hardwood total	268	306	76	69	64	–109	24	5	4	–	3	–	–	–	711
All species	428	673	415	490	553	–43	242	228	–142	–331	–252	–52	36	66	2,311
All Provinces															
White fir	XXXXX	488	513	322	279	44	51	138	–57	140	–70	31	22	123	2,024
Subalpine fir	XXXXX	2,457	1,090	–1,448	–1,597	–2,724	–653	–1,269	–144	137	–772	–15	40	–242	–5,139
Utah juniper[2]	345	363	483	437	517	470	344	234	212	177	123	97	60	158	4,021
Rocky Mountain juniper[2]	56	54	34	20	78	18	18	14	13	3	1	2	1	–	312
Engelmann spruce	XXXXX	1,584	1,049	756	705	820	410	381	–65	–176	205	35	22	47	5,772
Blue spruce	XXXXX	182	54	7	52	18	33	–	29	22	6	–199	16	10	232
Bristlecone pine	XXXXX	–	–	–	–	–	–	19	–	–	–	–	–	–	19
Common pinyon[2]	322	301	284	203	349	306	77	167	106	95	84	46	33	24	2,398
Lodgepole pine	XXXXX	8,624	1,628	–656	522	–1,360	–1,384	–1,653	–449	69	–323	9	3	3	5,034
Limber pine	XXXXX	83	61	10	–294	40	83	44	25	37	30	1	7	–45	81
Ponderosa pine	XXXXX	465	271	105	102	–3	154	40	55	78	50	21	34	–132	1,239
Singleleaf pinyon[2]	63	89	112	99	62	31	–125	13	7	10	–	–	–	–	362
Douglas-fir	XXXXX	2,081	2,091	1,777	1,785	1,841	1,822	400	797	310	–26	224	245	237	13,583
Softwood total	786	16,770	7,672	1,632	2,560	–499	830	–1,473	529	903	–692	252	484	182	29,937
Rocky Mountain maple[2]	134	73	42	38	12	5	–	–	–	–	–	–	–	–	305
Bigtooth maple[2]	1,296	360	132	–63	92	80	22	44	7	–	–	–	–	–	1,968
Curlleaf mtn. mahogany[2]	58	73	94	71	50	35	7	18	12	2	–	–	–	–	420
Aspen	XXXXX	10,118	3,835	2,166	332	3	–446	–769	–319	11	7	–	–	–	14,937
Other poplar	XXXXX	–	3	7	9	7	17	7	–195	11	37	4	17	–90	–168
Gambel oak[2]	2,518	612	188	50	9	–	–	–	–	–	–	–	–	–	3,376
Hardwood total	4,006	11,236	4,293	2,270	504	129	–400	–701	–495	24	43	4	17	–90	20,838
All species[3]	4,792	28,006	11,964	3,902	3,064	–370	430	–2,174	34	926	–648	256	501	92	50,775

[1] Species with 'XXXXX' do not have growth calculations made below a 5" diameter.
[2] Diameter taken at root collar rather than at breast height and measured to a 3.0" minimum instead of 5.0".
[3] Less than 500 cubic feet.

Table 6–Annual mortality on forest land by province, species, and diameter class in northern Utah, 1992

Species	Diameter class (inches)														Total
	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	
	Thousand cubic feet														
Desert															
Subalpine fir	XXXXX[1]	73	–	–	–	–	–	–	86	–	–	–	–	–	159
Utah juniper[2]	XXXXX	–	–	–	–	–	78	87	–	–	–	–	–	–	164
Common pinyon[2]	1	10	62	145	–	28	158	–	–	–	–	–	–	–	404
Singleleaf pinyon[2]	–	–	–	–	–	–	140	–	–	–	–	–	–	–	140
Douglas-fir	XXXXX	–	–	62	99	89	–	145	–	–	–	84	–	–	478
Softwood total	1	83	62	207	99	117	375	232	86	–	–	84	–	–	1,346
Aspen	XXXXX	–	216	142	383	–	460	721	240	–	–	–	–	–	2,163
Other poplar	XXXXX	–	–	–	–	–	–	–	206	–	–	–	–	101	307
Hardwood total	XXXXX	–	216	142	383	–	460	721	446	–	–	–	–	101	2,469
All species	1	83	279	349	482	117	836	953	532	–	–	84	–	101	3,815
Southern Rockies															
White fir	XXXXX	197	–	348	355	330	302	334	179	–	157	–	–	–	2,202
Subalpine fir	XXXXX	509	1,259	4,253	3,369	3,849	1,579	1,948	459	132	886	132	–	285	18,660
Engelmann spruce	XXXXX	–	266	596	967	546	858	254	824	596	123	134	126	153	5,443
Blue spruce	XXXXX	–	–	–	–	–	–	–	–	–	–	227	–	–	227
Common pinyon[2]	–	7	11	63	–	56	–	–	–	–	–	–	–	–	137
Lodgepole pine	XXXXX	797	3,270	4,370	1,644	2,687	1,970	2,042	635	–	334	–	–	–	17,749
Limber pine	XXXXX	–	–	–	309	–	–	–	–	–	–	–	–	106	415
Ponderosa pine	XXXXX	–	63	–	90	78	–	–	–	–	–	–	–	152	384
Douglas-fir	XXXXX	68	70	318	801	170	315	1,028	–	–	185	–	–	204	3,159
Softwood total	–	1,578	4,939	9,948	7,536	7,716	5,024	5,607	2,097	728	1,684	493	126	900	48,376
Rocky Mountain maple[2]	12	–	–	–	–	–	–	–	–	–	–	–	–	–	12
Bigtooth maple[2]	60	67	68	179	–	–	–	–	–	–	–	–	–	–	374
Curlleaf mtn. mahogany[2]	8	–	–	–	–	–	–	–	–	–	–	–	–	–	8
Aspen	XXXXX	1,762	2,315	752	781	440	104	82	98	–	–	–	–	–	6,333
Gambel oak[2]	163	9	–	–	–	–	–	–	–	–	–	–	–	–	173
Hardwood total	242	1,839	2,383	931	781	440	104	82	98	–	–	–	–	–	6,899
All species	242	3,417	7,322	10,879	8,316	8,156	5,128	5,689	2,195	728	1,684	493	126	900	55,275
Semidesert[3]															
Nevada-Utah Mountains															
White fir	XXXXX	–	67	–	–	–	–	–	–	–	–	–	–	–	67
Rocky Mountain juniper[2]	–	–	32	55	–	–	–	–	–	–	–	–	–	–	87
Common pinyon[2]	2	–	59	111	89	–	–	–	–	–	–	–	–	–	261
Douglas-fir	XXXXX	29	52	–	–	405	146	56	395	492	352	152	–	–	2,079
Softwood total	2	29	210	166	89	405	146	56	395	492	352	152	–	–	2,494
Curlleaf mtn. mahogany[2]	–	7	–	–	–	–	–	–	–	–	–	–	–	–	7
Aspen	XXXXX	–	–	–	–	123	–	–	–	–	–	–	–	–	123
Gambel oak[2]	12	–	–	–	–	–	–	–	–	–	–	–	–	–	12
Hardwood total	12	7	–	–	–	123	–	–	–	–	–	–	–	–	141
All species	13	36	210	166	89	528	146	56	395	492	352	152	–	–	2,635
All Provinces															
White fir	XXXXX	197	67	348	355	330	302	334	179	–	157	–	–	–	2,269
Subalpine fir	XXXXX	582	1,259	4,253	3,369	3,849	1,579	1,948	545	132	886	132	–	285	18,819
Utah juniper[2]	–	–	–	–	–	–	78	87	–	–	–	–	–	–	164
Rocky Mountain juniper[2]	–	–	32	55	–	–	–	–	–	–	–	–	–	–	87
Engelmann spruce	XXXXX	–	266	596	967	546	858	254	824	596	123	134	126	153	5,443
Blue spruce	XXXXX	–	–	–	–	–	–	–	–	–	–	227	–	–	227
Common pinyon[2]	2	17	132	320	89	84	158	–	–	–	–	–	–	–	802
Lodgepole pine	XXXXX	797	3,270	4,370	1,644	2,687	1,970	2,042	635	–	334	–	–	–	17,749
Limber pine	XXXXX	–	–	–	309	–	–	–	–	–	–	–	–	106	415
Ponderosa pine	XXXXX	–	63	–	90	78	–	–	–	–	–	–	–	152	384
Singleleaf pinyon[2]	–	–	–	–	–	–	140	–	–	–	–	–	–	–	140
Douglas-fir	XXXXX	97	121	379	900	664	461	1,229	395	492	537	236	–	204	5,716
Softwood total	2	1,691	5,211	10,321	7,723	8,238	5,545	5,895	2,578	1,220	2,037	729	126	900	52,216
Rocky Mountain maple[2]	12	–	–	–	–	–	–	–	–	–	–	–	–	–	12
Bigtooth maple[2]	60	67	68	179	–	–	–	–	–	–	–	–	–	–	374
Curlleaf mtn. mahogany[2]	8	7	–	–	–	–	–	–	–	–	–	–	–	–	15
Aspen	XXXXX	1,762	2,531	894	1,164	563	564	803	338	–	–	–	–	–	8,619
Other poplar	XXXXX	–	–	–	–	–	–	–	206	–	–	–	–	101	307
Gambel oak[2]	175	9	–	–	–	–	–	–	–	–	–	–	–	–	184
Hardwood total	254	1,846	2,599	1,073	1,164	563	564	803	544	–	–	–	–	101	9,510
All species	256	3,537	7,810	11,394	8,887	8,801	6,109	6,698	3,122	1,220	2,037	729	126	1,001	61,726

[1] Species with 'XXXXX' do not have mortality calculations made below a 5" diameter

[2] Diameter taken at root collar rather than at breast height and measured to a 3.0" minimum instead of 5.0"

[3] No evidence of mortality on plots sampled in this province

Table 7–Annual mortality on forest land by province, species, and cause of death in northern Utah, 1992

Species	Cause of death								
	Insects	Disease	Fire	Animal	Weather	Suppression	Unknown	Logging	Total
	Thousand cubic feet								
Desert									
Subalpine fir	–	86	–	–	–	73	–	–	159
Utah juniper[1]	–	–	–	–	–	–	164	–	164
Common pinyon[1]	38	305	–	–	–	–	61	–	404
Singleleaf pinyon[1]	–	–	–	–	–	–	140	–	140
Douglas-fir	478	–	–	–	–	–	–	–	478
Softwood total	516	390	–	–	–	73	366	–	1,346
Aspen	–	1,886	–	–	210	–	67	–	2,163
Other poplar	–	–	–	–	206	–	101	–	307
Hardwood total	–	1,886	–	–	416	–	167	–	2,469
All species	516	2,276	–	–	416	73	533	–	3,815
Southern Rockies									
White fir	1,476	139	–	–	–	–	586	–	2,202
Subalpine fir	4,762	6,523	–	–	4,345	–	3,030	–	18,660
Engelmann spruce	2,495	371	109	–	1,644	–	822	–	5,443
Blue spruce	114	–	–	–	–	–	113	–	227
Common pinyon[1]	–	56	–	11	–	–	70	–	137
Lodgepole pine	13,595	1,396	422	109	685	–	1,543	–	17,749
Limber pine	211	204	–	–	–	–	–	–	415
Ponderosa pine	90	–	293	–	–	–	–	–	384
Douglas-fir	1,913	552	68	–	70	–	557	–	3,159
Softwood total	24,658	9,241	893	119	6,744	–	6,722	–	48,376
Rocky Mountain maple[1]	–	–	–	–	–	–	12	–	12
Bigtooth maple[1]	–	221	35	–	–	–	118	–	374
Curlleaf mtn. mahogany[1]	8	–	–	–	–	–	–	–	8
Aspen	379	3,936	150	–	204	–	1,582	82	6,333
Gambel oak[1]	8	9	7	–	–	7	141	–	173
Hardwood total	395	4,166	192	–	204	7	1,853	82	6,899
All species	25,052	13,407	1,085	119	6,948	7	8,575	82	55,275
Semidesert[2]									
Nevada-Utah Mountains									
White fir	67	–	–	–	–	–	–	–	67
Rocky Mountain juniper[1]	55	–	32	–	–	–	–	–	87
Common pinyon[1]	241	2	–	–	–	–	18	–	261
Douglas-fir	1,796	146	81	–	56	–	–	–	2,079
Softwood total	2,159	148	113	–	56	–	18	–	2,494
Curlleaf mtn. mahogany[1]	–	–	–	–	–	–	7	–	7
Aspen	–	123	–	–	–	–	–	–	123
Gambel oak[1]	–	–	–	–	–	–	12	–	12
Hardwood total	–	123	–	–	–	–	18	–	141
All species	2,159	271	113	–	56	–	37	–	2,635
All Provinces									
White fir	1,544	139	–	–	–	–	586	–	2,269
Subalpine fir	4,762	6,608	–	–	4,345	73	3,030	–	18,819
Utah juniper[1]	–	–	–	–	–	–	164	–	164
Rocky Mountain juniper[1]	55	–	32	–	–	–	–	–	87
Engelmann spruce	2,495	371	109	–	1,644	–	822	–	5,443
Blue spruce	114	–	–	–	–	–	113	–	227
Common pinyon[1]	279	363	–	11	–	–	150	–	802
Lodgepole pine	13,595	1,396	422	109	685	–	1,543	–	17,749
Limber pine	211	204	–	–	–	–	–	–	415
Ponderosa pine	90	–	293	–	–	–	–	–	384
Singleleaf pinyon[1]	–	–	–	–	–	–	140	–	140
Douglas-fir	4,187	698	149	–	126	–	557	–	5,716
Softwood total	27,333	9,779	1,006	119	6,800	73	7,106	–	52,216
Rocky Mountain maple[1]	–	–	–	–	–	–	12	–	12
Bigtooth maple[1]	–	221	35	–	–	–	118	–	374
Curlleaf mtn. mahogany[1]	8	–	–	–	–	–	7	–	15
Aspen	379	5,945	150	–	414	–	1,649	82	8,619
Other poplar	–	–	–	–	206	–	101	–	307
Gambel oak[1]	8	9	7	–	–	7	153	–	184
Hardwood total	395	6,175	192	–	620	7	2,039	82	9,510
All species	27,727	15,954	1,198	119	7,420	81	9,145	82	61,726

[1] Diameter taken at root collar rather than at breast height and measured to a 3" minimum instead of 5.0".

[2] No evidence of mortality on plots sampled in this providence.

Table 8–Number of snags on forest land by province, species, and diameter class in northern Utah, 1993.

Species	Diameter class (inches) 3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-24.9	25.0-26.9	27.0-28.9	29.0+	Total
	Thousand trees														
Desert															
Subalpine fir	XXXXX[1]	335	–	–	–	–	52	–	10	–	–	–	–	–	397
Utah juniper[2]	71	366	516	768	792	328	382	292	209	89	35	–	70	27	3,945
Common pinyon[2]	168	121	327	378	264	147	190	65	91	45	101	–	–	–	1,897
Limber pine	XXXXX	–	–	–	24	–	–	–	–	–	–	–	–	–	24
Singleleaf pinyon[2]	65	–	130	65	–	65	97	–	–	–	–	–	–	–	422
Douglas-fir	XXXXX	–	–	215	119	38	52	36	–	52	7	12	5	4	540
Softwood total	304	822	974	1,426	1,199	579	772	393	310	186	143	12	75	31	7,226
Curlleaf mtn. mahogany[2]	–	–	281	226	–	178	–	–	–	–	–	–	–	–	684
Aspen	XXXXX	262	439	95	63	–	41	63	24	–	–	–	–	–	986
Other poplar	XXXXX	–	–	–	–	–	–	–	35	–	–	–	–	7	42
Gambel oak[2]	1,084	145	–	–	–	–	–	–	–	–	–	–	–	–	1,229
Hardwood total	1,084	406	719	321	63	178	41	63	59	–	–	–	–	7	2,940
All species	1,388	1,228	1,693	1,747	1,262	757	813	456	369	186	143	12	75	38	10,167
Southern Rockies															
White fir	XXXXX	435	285	214	134	69	61	42	25	15	13	–	–	–	1,292
Subalpine fir	XXXXX	2,497	2,558	1,650	1,227	898	295	282	85	38	64	20	–	18	9,633
Utah juniper[2]	–	29	230	156	189	109	29	50	29	36	–	–	–	77	933
Rocky Mountain juniper[2]	–	–	–	–	48	48	–	–	–	–	–	–	–	–	96
Engelmann spruce	XXXXX	1,150	427	826	890	758	377	396	225	123	90	46	54	25	5,385
Blue spruce	XXXXX	–	–	45	–	–	–	–	–	–	–	13	–	–	58
Common pinyon[2]	29	487	103	54	139	134	43	38	53	–	–	–	–	48	1,128
Lodgepole pine	XXXXX	8,804	8,770	6,129	3,032	1,386	1,106	521	127	94	16	10	–	–	29,995
Limber pine	XXXXX	–	–	–	131	–	77	85	73	11	16	19	–	16	428
Ponderosa pine	XXXXX	135	208	53	89	18	16	11	12	8	8	14	5	9	587
Douglas-fir	XXXXX	1,311	576	559	484	129	75	154	74	44	18	14	–	46	3,484
Softwood total	29	14,847	13,157	9,688	6,364	3,548	2,077	1,580	705	368	225	135	59	238	53,020
Rocky Mountain maple[2]	680	60	60	–	–	34	–	–	–	–	–	–	–	–	835
Bigtooth maple[2]	3,999	1,790	392	206	–	–	–	–	–	–	–	–	–	–	6,387
Curlleaf mtn. mahogany[2]	409	1,380	577	262	184	–	52	–	–	–	–	–	–	–	2,864
Aspen	XXXXX	13,368	4,655	1,224	456	184	50	–	11	–	–	–	–	–	19,949
Other poplar	XXXXX	–	–	–	–	–	38	–	–	–	–	–	–	–	38
Gambel oak[2]	11,251	1,364	171	–	–	–	–	–	–	–	–	–	–	–	12,786
Hardwood total	16,340	17,962	5,857	1,693	640	219	140	–	11	–	–	–	–	–	42,860
All species	16,369	32,809	19,014	11,380	7,004	3,767	2,217	1,580	715	368	225	135	59	238	95,880
Semidesert															
Subalpine fir	XXXXX	–	182	–	–	49	–	–	–	–	–	–	–	–	231
Utah juniper[2]	–	48	–	–	43	56	–	–	–	–	43	–	–	–	191
Common pinyon[2]	–	–	–	–	–	29	–	–	–	–	–	–	–	–	29
Singleleaf pinyon[2]	57	–	57	–	170	57	–	–	–	–	–	–	–	–	340
Douglas-fir	XXXXX	–	53	–	–	–	–	–	–	–	–	–	–	–	53
Softwood total	57	48	292	–	213	191	–	–	–	–	43	–	–	–	844
Curlleaf mtn. mahogany[2]	–	–	–	37	–	–	–	–	–	–	–	–	–	–	37
Hardwood total	–	–	–	37	–	–	–	–	–	–	–	–	–	–	37
All species	57	48	292	37	213	191	–	–	–	–	43	–	–	–	881
Nevada-Utah Mountains															
White fir	XXXXX	–	73	–	–	27	23	–	29	–	–	–	–	–	152
Subalpine fir	XXXXX	–	–	–	33	–	23	–	–	–	–	–	–	–	57
Utah juniper[2]	158	173	108	209	208	23	263	213	177	71	–	35	23	–	1,661
Rocky Mountain juniper[2]	–	–	53	102	–	–	–	–	–	–	–	–	–	–	155
Common pinyon[2]	118	164	200	214	220	307	151	–	–	–	–	–	–	–	1,375
Douglas-fir	XXXXX	92	59	–	117	248	22	40	55	46	36	23	–	–	738
Softwood total	276	429	494	524	578	605	483	253	261	117	36	58	23	–	4,137
Curlleaf mtn. mahogany[2]	79	246	–	–	–	–	–	–	–	–	–	–	–	–	325
Aspen	XXXXX	471	127	78	–	43	–	–	–	–	–	–	–	–	719
Gambel oak[2]	931	212	–	–	–	–	–	–	–	–	–	–	–	–	1,143
Hardwood total	1,011	929	127	78	–	43	–	–	–	–	–	–	–	–	2,188
All species	1,287	1,358	621	603	578	648	483	253	261	117	36	58	23	–	6,325
All Provinces															
White fir	XXXXX	435	358	214	134	96	84	42	54	15	13	–	–	–	1,444
Subalpine fir	XXXXX	2,832	2,740	1,650	1,260	946	370	282	96	38	64	20	–	18	10,317
Utah juniper[2]	228	616	854	1,133	1,233	516	674	555	416	195	78	35	93	104	6,731
Rocky Mountain juniper[2]	–	–	53	102	48	48	–	–	–	–	–	–	–	–	251
Engelmann spruce	XXXXX	1,150	427	826	890	758	377	396	225	123	90	46	54	25	5,385
Blue spruce	XXXXX	–	–	45	–	–	–	–	–	–	–	13	–	–	58
Common pinyon[2]	316	772	631	646	623	617	383	102	144	45	101	–	–	48	4,428
Lodgepole pine	XXXXX	8,804	8,770	6,129	3,032	1,386	1,106	521	127	94	16	10	–	–	29,995
Limber pine	XXXXX	–	–	–	155	–	77	85	73	11	16	19	–	16	452
Ponderosa pine	XXXXX	135	208	53	89	18	16	11	12	8	8	14	5	9	587
Singleleaf pinyon[2]	122	–	187	65	170	122	97	–	–	–	–	–	–	–	763
Douglas-fir	XXXXX	1,402	688	774	719	416	149	230	129	143	62	48	5	50	4,816
Softwood total	666	16,146	14,916	11,638	8,354	4,924	3,332	2,226	1,276	672	447	205	158	269	65,227
Rocky Mountain maple[2]	680	60	60	–	–	34	–	–	–	–	–	–	–	–	835
Bigtooth maple[2]	3,999	1,790	392	206	–	–	–	–	–	–	–	–	–	–	6,387
Curlleaf mtn. mahogany[2]	489	1,625	858	525	184	178	52	–	–	–	–	–	–	–	3,911
Aspen	XXXXX	14,101	5,221	1,398	519	227	91	63	34	–	–	–	–	–	21,654
Other poplar	XXXXX	–	–	–	–	–	38	–	35	–	–	–	–	7	80
Gambel oak[2]	13,267	1,720	171	–	–	–	–	–	–	–	–	–	–	–	15,158
Hardwood total	18,435	19,297	6,703	2,129	703	439	181	63	69	–	–	–	–	7	48,025
All species	19,101	35,443	21,619	13,767	9,056	5,363	3,513	2,289	1,345	672	447	205	158	276	113,253

[1] Species with 'XXXXX' were not included below a 5" diameter.

[2] Diameter taken at root collar rather than at breast height and measured to a 3" minimum instead of 5.0".

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O'Brien, Renee A. 1996. Forest resources of northern Utah ecoregions. Resour. Bull. INT-RB-87. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 34 p.

Presents forest resource information such as major species, biomass, growth, mortality, habitat types, ownership, and land use patterns for northern Utah ecoregions.

Keywords: ecoregion, forest land, sample-based, species, biomass, habitat types, growth, mortality, land use, forest health

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